



Instruction Manual

Gaulin Homogenizers

Model 803/804/805



Read and understand this manual prior to operating or servicing this product.



TABLE OF CONTENTS

FRONTISPIECE	THIS IS YOUR MACHINE (Inserted at front only in manual supplied with machine.)	
	PACKING LIST (Inserted at front only in manual supplied with machine.)	
SECTION I	GENERAL INFORMATION	Page
	Damage in Transit	1-1
	Machine Weights & Dimensions	1-1
	Utility Requirements	1-1
	Electrical	1-1
	Water	1-1
	Piping	1-1
	If Start-Up is Delayed	1-2
	How To Order Parts	1-2
	How To Return Materials	1-2
SECTION II	INSTALLATION	
	Uncrating Instructions	2-1
	Location	2-1
	Floor Space	2-1
	Removal From Skids	2-1
	Adjustable Feet	2-1
	Machine Leveling	2-1
	Water Supply	2-1
	Oil Coolers	2-2
	Piston Spray	2-2
	Lubricating Oil	2-2
	HVA System Oil	2-2
	Electrical	2-3
	Main Motor	2-3
	Lube Oil Pump Motor	2-3
	HVA Oil Pump Motor	2-3
	Belt Tension and Care	2-3
	Product Piping	2-5
SECTION III	THE CYLINDER ASSEMBLY	
	Introduction	3-1
	Cylinder Disassembly	3-1
	Cylinder Reassembly	3-2
SECTION IV	THE MICRO-GAP® HOMOGENIZING VALVE	
	Introduction	4-1
	Installation	4-2
	Disassembly of the Micro-Gap Valve Components	4-3
	Reassembly of the Micro-Gap Valve Components	4-3
	Disassembly of the HVA Mechanism	4-5
	Reassembly of the HVA Mechanism	4-5
	Micro-Gap Valve Discharge Piping and Back-Pressure Control	4-6

Table of Contents

	Page
SECTION V	HOMOGENIZER OPERATION
	Test Operation 5-1
	Constant Requirements 5-2
	Starting the Machine 5-2
	Product Operation 5-3
	Shut-Down 5-3
	Cleaning 5-3
SECTION VI	RECOMMENDED REGULAR MAINTENANCE SCHEDULE
	Daily Inspection 6-1
	Monthly Inspection 6-1
	Six-Month or Yearly Inspection 6-1
SECTION VII	MAINTENANCE PROCEDURES
	Introduction 7-1
	Cylinder Stud Installation 7-1
	Packing Removal 7-2
	Reinstallation of Packing 7-2
	Water Spray Assembly Adjustment 7-3
	Suction & Discharge Valves & Seats 7-4
	Pump Valve Seat Removal and Replacement 7-4
	Capacity Check 7-4
	Product Pressure Gauge 7-5
	Micro-Gap Valve Wear/Conditioning 7-5
	Micro-Gap Valve Assembly Leakage 7-5
	Power-End Lubrication 7-6
	Oil Changing 7-6
	Oil Pump and Relief Valve Adjustment 7-6
	Low Oil Pressure Safety Cut-Out Switch Adjustment 7-7
	Cooling Water and Oil Temperature 7-7
	Motor Lubrication 7-8
	Motor Warranty 7-8
	Connecting Rod and Crosshead Assemblies 7-8
	Crosshead Extension and Baffle Seal Packing 7-9
	Gear and Pinion 7-9
	Gear Shrink-Disc Connection 7-10
	Driveshaft 7-11
	Gear and Driveshaft Pinion Assembly Removal 7-11
	Driveshaft Assembly and Installation 7-12
	Shrink-Disc Disassembly and Reassembly 7-13
	Eccentric Shaft and Bearings 7-14
SECTION VIII	AUXILLIARY PRODUCTS
	APV GAULIN WARRANTY

LIST OF ILLUSTRATIONS

SECTION II		Page
Figs. 1&2	Belt Tensioning	2-4
Dwg. D17270	Base Outline, Model 803	2-6
D17269	Base Outline, Model 804/805	2-7
SECTION III		
Fig. 3	Model 803 Rear Plate Torquing Diagram	3-3
4	Model 803 Front Plate Torquing Diagram	3-4
5	Model 804/805 Front Plate Torquing Diagram	3-4
6	Typical Tools Supplies	3-6
7	Cylinder Parts List	3-6
Dwg. D17132	Model 803 Cylinder	3-7
D17194	Model 804/805 Cylinder	3-8
C17373	Cylinder Plug & Piston Removal Tools	3-9
SECTION IV		
Fig. 8	Micro-Gap Homogenizing Valve Cut-away	4-2
9	Micro-Gap Valve Stack & Top Plug	4-3
10	Restrictor Backpressure Control	4-7
11	Manual, Air-Operated Backpressure Control	4-8
12	Automatic, Air-Operated Backpressure Control	4-9
Dwg. D17408	Micro-Gap Homogenizing Valve Assembly	4-10
SECTION V		
Fig. 13	Pressure/Average Curve Chart	5-1
SECTION VII		
Fig. 14	Assembly of Piston Packing	7-2
15	Water Spray Nozzle Adjustment	7-3
16	Rear of Machine—Photo	7-7
17	Gear & Pinion	7-10
18	Shrink Disc Diagram, Model 803	7-11
19	Shrink Disc Diagram, Model 804/805	7-11
20	Shrink Disc Torquing Diagram	7-12
21	Shrink Disc Lubrication (Models 804/805)	7-13
22	Parts List For Figures 23 and 24	7-15
23 & 24	Typical Base/Drive Components—Exploded View	7-16—7-17
Dwg. C17660	Wiring Diagram—HVA, Main and Auxilliary Oil Pump Motors	7-18
D17463	Model 803 Oil & Waterline Piping & Fittings	7-19
D17459	Model 804/805 Oil & Waterline Piping & Fittings	7-20
B17440	Skin Assembly	7-21
D17477	HVA Piping/Controls Diagram	7-22

SECTION I

GENERAL INFORMATION

Complete familiarity with your APV Gaulin homogenizer and its working parts will give you an increased awareness of its superior construction and wide range of capabilities. Study this manual carefully. It will help you to install the machine correctly, operate it safely and efficiently, and maintain it properly.

Damage in Transit

Occasionally, a machine suffers damage during transit or unloading procedures. Inspect the exterior of the crate and, if found damaged, open the crate and inspect the machine carefully. If any damage is evident, it is your responsibility to file a claim with the carrier immediately and notify APV Gaulin, Inc.

Machine Weights and Dimensions

Size	Dimensions	Weight (Less Motor)
803	Dwg. D17270	5,400 lbs.
804/805	Dwg. D17269	9,000 lbs.

Utility Requirements

1. Electrical

It is suggested that a licensed electrician be employed to properly wire in accordance with local codes. See typical wiring diagram, C17760. The following will require power supply/wiring connection:

- Main drive motor (check motor nameplate)
- Hydraulic pump motor — $\frac{3}{4}$ hp, 3-phase
- Lube oil pump motor — $\frac{3}{4}$ hp, 3-phase
- Low oil pressure cut-out switch
- Push/pull switch to start and stop main drive motor and lube oil pump motor
- Push/pull switch to start and stop hydraulic pump motor

2. Water

See text in "Installation" section of this manual for details. The following will require water connections:

- Lube oil and hydraulic oil coolers
- Piston spray systems

3. Standard Sanitary Piping Connections.

Model	Suction Connection	Discharge Connection
803	3" Tri-Clamp	2" Tri-Clamp
804/805	4" Tri-Clamp	2" Tri-Clamp

If Start-Up Is Delayed More Than One Month

Often, APV Gaulin homogenizers are not installed and placed in operation immediately after their arrival at the job-site. As soon as possible after its arrival at the plant, the unit should be uncrated, per instruction. After the spare parts and tools have been checked against the packing list, we suggest that they be stored in a suitable place to prevent loss or damage.

There are many removable parts in the cylinder assembly, as shown on the applicable drawing. If the start-up is to be delayed for more than one month, it is suggested that all cylinder metal parts and gaskets be removed and stored with spare parts and tools. When a homogenizer valve is supplied, it should also be disassembled and parts stored with above. All parts should be wrapped separately to prevent damage.

Parts in the power-end have been cleaned and lightly coated with a lubricant, prior to shipping as a temporary protection against rust. On delayed start-up it is essential that these parts be thoroughly coated with a corrosion-proof grease or sprayed with a vapor-phase inhibitor.

The complete machine should then be covered with a plastic sheet or other suitable cover to protect it against weather, dirt, dampness, etc.

When the machine is installed on location, the APV Gaulin distributor in your area should be contacted and advised of the approximate date of initial start-up, so that assistance and correct assembling instructions can be offered.

How To Order Parts

Contact your local APV Gaulin distributor. To help them to help you, have the following information available:

1. your machine MODEL and SERIAL NUMBER;
2. the part number, as indicated on the "Recommended Spare Parts" list supplied with the machine, or from illustrations in this manual by CORRECT NAME and use item numbers.

Your specific machine identification data is located at the front of *the manual supplied with the machine*. Model and serial number will be found on the packing list and, also, at the front of the manual. The serial number will be found on a nameplate at the rear of the piston well.

How To Return Materials

Materials or equipment cannot be returned without first obtaining APV Gaulin's written permission. Materials and/or equipment accepted for credit are subject to a service charge, plus all transportation charges. Materials or equipment built to order are not subject to return for credit under any circumstances. Any materials or equipment authorized for return must be securely packed to reach APV Gaulin, Inc., without damage.

SECTION II

INSTALLATION

Uncrating Instructions

Instructions for uncrating your machine are attached to the shipping crate. The top and sides of the crate can be removed, prior to moving the machine to the installation area on the skids provided. Uncrating at the installation area is preferable. Reasonable care must be exercised to avoid damage to the unit during the removal of the crate. An Operation and Service Manual with a packing list and identification sheet will be found with the spare parts in the motor compartment.

Location

Your APV Gaulin machine is an integral part of your processing system, and its location as a system component should be carefully planned and selected. Ease and efficiency of operation, as well as proper maintenance, depends largely upon the thought given to final location, before the machine is actually placed in position.

Weight and Dimensions

The machine weight and dimension information is found in the "General Information" section at the front of this manual.

Floor Space

The floor space required for this machine is shown in drawing D17270 for the Model 803 and drawing D17269 for Models 804/805, both located at the end of this section. Additional space is required to service the machine. When viewing from the front, the following space is required: 50" on right side, 50" on left side for motor service and removal, 36" at rear for servicing of all equipment (oil change, small motors and pumps, relief valves, etc.), and 36" in front of machine for removal of piston and packing assemblies.

Removal From Skids

The machine must be lifted off the bolts which pass through the shipping skids. Do not lift the machine by the ends or edges, as permanent damage may result. Lifting or blocking should be done on the reinforced area under the sub-base.

Adjustable Feet

When installing the adjustable feet, make sure the threads are clean and cover them with a graphite paste or water-resistant grease to prevent rust. Screw them up into the tapped holes under the base. There is approximately 1" of total adjustment.

Machine Leveling

The unit should be approximately level for best operation. Use the machined surfaces of the cylinder block for leveling side-to-side and front-to-back.

Water Supply

This machine requires water for cooling the power-end oil, the hydraulic valve-actuator oil and the piston packing. It is suggested that a single source of supply be located that is not affected by usage

in the rest of the plant, as far as volume and pressure are concerned. It is good practice to install a solenoid shut-off valve in the water supply line, so that the water will be automatically turned on when the main motor is started and turned off when the machine is shut down.

The supply line should be split (tee) close to the machine to supply separate lines to the oil coolers and the piston spray assemblies to allow individual control.

1. Oil Coolers

The oil coolers are located behind the rear panel of the machine and are pre-connected at the Factory. A hand-operated valve must be installed at the inlet to control the flow of water through the coolers. Both the inlet and outlet for the oil coolers are 3/8" NPT, and the location of these fittings are shown on drawings D17270 (Model 803) and D17269 (Models 804/805).

The drain from the oil coolers may be piped to a drain in the floor or recycled to a cooling tower, boiler-feed water tank, etc., providing there is no shut-off valve in the line and the water pressure never exceeds the rated pressure of the coolers of 100 psig.

2. Piston Spray Water

A hand-operated valve should be installed in the line feeding the piston spray system to control the water flow. The connection on the machine is located at the front bottom of the sub-base and is 3/8" NPT. See Drawing D17270 (Model 803) and D17269 (Models 804/805) for location.

Lubricating Oil

This machine uses roller bearings on the driveshaft and sleeve bearings on the eccentric shaft. A combination oil splash-and-mist lubrication system is used on the gears and roller bearings. Pressure lubrication is used for the sleeve bearings, connecting rods and crossheads.

All oil was drained from the power-end after a run-in period at the Factory. Add the oil to the crankcase, until the oil level is in the center of the oil level gauge. **DO NOT USE OIL OTHER THAN THAT SPECIFIED FOR YOUR PARTICULAR MACHINE.** Correct crankcase oil may be purchased from APV Gaulin, and the initial quantity is furnished with the machine when purchased.

The oil required is a premium grade, paraffinic base, A.G.M.A. No. 5 industrial lubricating oil with a defoaming agent and oxidation and corrosion inhibitors. It has a viscosity of 1000/1165 SUS at 100°F. and 90 to 105 SUS at 210°F. with a viscosity index of 95, pour point 10°F. and flash point 450°F. This oil is available in 5-gallon cans (Part No. 811100) and 55-gallon drums (Part No. 811101).

Oil Capacity Chart	
Model	Oil Capacity
803	4 gallons
804/805	9 gallons

HVA System Oil

All oil was drained from the power-end after a run-in period at the Factory. Fill the HVA oil tank, located at the rear of the machine, with the specified oil to within 1-1½" from the top.

Use a premium grade, paraffinic base, industrial lubricating oil with a defoaming agent and oxidation and corrosion inhibitors. The viscosity is 400 to 450 SUS at 100°F. and 60 to 70 SUS at 210°F. with a minimum viscosity index of 90, pour point maximum 15°F. and flash point 465°F. minimum. This oil is available in two-gallon cans (Part No. 811802).

MOTOR WARRANTY: The motors provided with the machine have been selected to meet load requirements and are covered by a warranty issued by the motor manufacturer. The motors should be lubricated in accordance with the manufacturer's recommendations. Although unlikely, should difficulty arise, contact the local representative of the motor manufacturer, our representative or the Factory. If any modification or repair not authorized by the manufacturer is undertaken, the warranty is automatically voided.

WARNING: Before connecting the motor, be sure that the piston and packing assemblies have been removed from the cylinder.

1. Main Motor

The main drive motor has been sized to meet the requirements of your machine's capacity, operating pressure and your electrical specifications. It must be wired to meet local codes.

Normal rotation of the main motor is counter-clockwise, when viewed from the pulley side. Motors supplied by APV Gaulin will also have the direction of rotation marked on the end-bell of the motor.

If the motor was not supplied by APV Gaulin and is to be mounted on-site, four shock-mount pads have been supplied with the spare parts. These pads should be installed between the feet of the motor and the rocker-arm mounts in the machine.

2. Lube Oil Pump Motor

The power-end lube-oil pump motor is located behind the rear panel (see Figure 16). It is a $\frac{3}{4}$ hp, 3-phase motor and must be wired to run simultaneously with the main motor. The direction of rotation is indicated on the motor by an arrow.

3. HVA Oil Pump Motor

The HVA oil pump motor is also located behind the rear panel (see Figure 16). It is a $\frac{3}{4}$ hp, 3-phase motor and should be wired to the HVA on/off switch provided at the control panel. The HVA pump should be wired independently of the main drive motor. The direction of rotation is indicated on the motor by an arrow.

WARNING: The HVA pump shaft seal will be damaged, if the pump is run in the wrong direction.

Belt Drive Tension and Care

The tension on V-belts will normally drop during the first few days of new machine operation or after belt replacement. During the first few days of operation, the belts will seat themselves in the sheave grooves and will require retensioning one or more times. Check belt tension often during the first days of operation and monthly thereafter.

Observe the belts while operating the machine under its highest load condition (either when starting or under peak load). Excessive bowing or squealing (see Figure 1) indicates improper tension.

Adjust the tension on the motor mounts to tighten the belts until, when placing a straight edge squarely across the backs of the belts at a central point between the sheaves and using moderate hand pressure, a deflection of 1/64" per inch (approximately 1.65 cm per 2.5 cm) of span is achieved (see Figure 2). This procedure will serve to tension the belts for normal service.

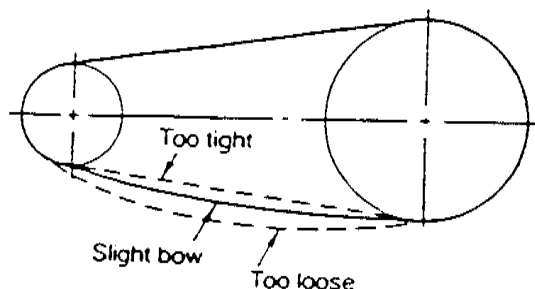


FIGURE 1

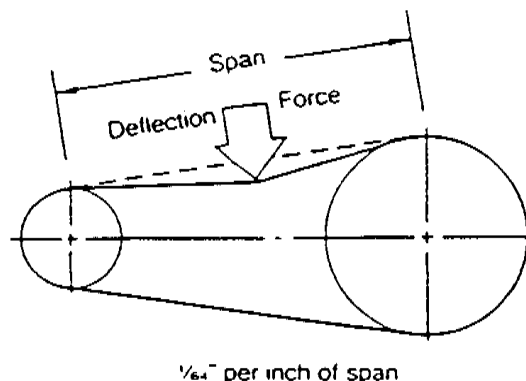


FIGURE 2

It is essential that adequate product piping to the machine be provided. The suction (inlet) piping size must never be smaller than the suction (inlet) connection and should be as short as possible.

The inlet system for your homogenizer must provide a constant flow of liquid to the cylinder at a pressure sufficiently above the product's vapor pressure to prevent flashing as the liquid enters the pumping chambers. If air bubbles are entrained in the liquid or if flashing occurs in the cylinder, excessive vibration may occur in both inlet and outlet lines; volumetric efficiency will drop, and various pump and system components will fail. Small amounts of air or cavitation will result in shortened life of packing, valve springs, valves seats and gaskets. Larger quantities of air or more severe cavitation can cause pitting of liquid-end components and catastrophic failure of the liquid pumping cylinder, crankshaft, bearings and drive-train components. The presence of air entering the suction line piping can cause loud knocking in both the cylinder block and the homogenizing valve, as well as erratic fluctuation of the pressure gauge indicator.

WARNING: Your machine is a positive-displacement pump. A three-way valve, designated for continuous open position, is required for altering the flow direction of processed material at the discharge directly from the unit. NEVER USE A FLOW CONTROL VALVE. The flow of processed material must never be stopped while the machine is in operation.

When processing viscous products, the suction pipe should be considerably larger than the suction inlet connection, and a suitable feed pump should be provided to ensure positive and adequate feed to the suction side of the pump.

To minimize suction-line pulsations it is recommended that an adequately sized suction-line "stand-pipe" be installed in the suction line close to the machine's inlet flange.

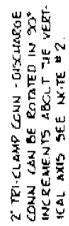
A suction (inlet) pressure gauge is recommended for use with the machine and is supplied as standard operating equipment. (The necessary tee and mounting fittings are to be supplied by the customer to meet his particular line-size requirements.)

It is also recommended that a suitable pulsation dampener is installed in the outlet line, beyond the flow restrictor attached to the Micro-Gap® homogenizing valve assembly. APV Gaulin offers a pipeline pulsation dampener ideally suited for the application. The dampener is designed for c.i.p procedures.

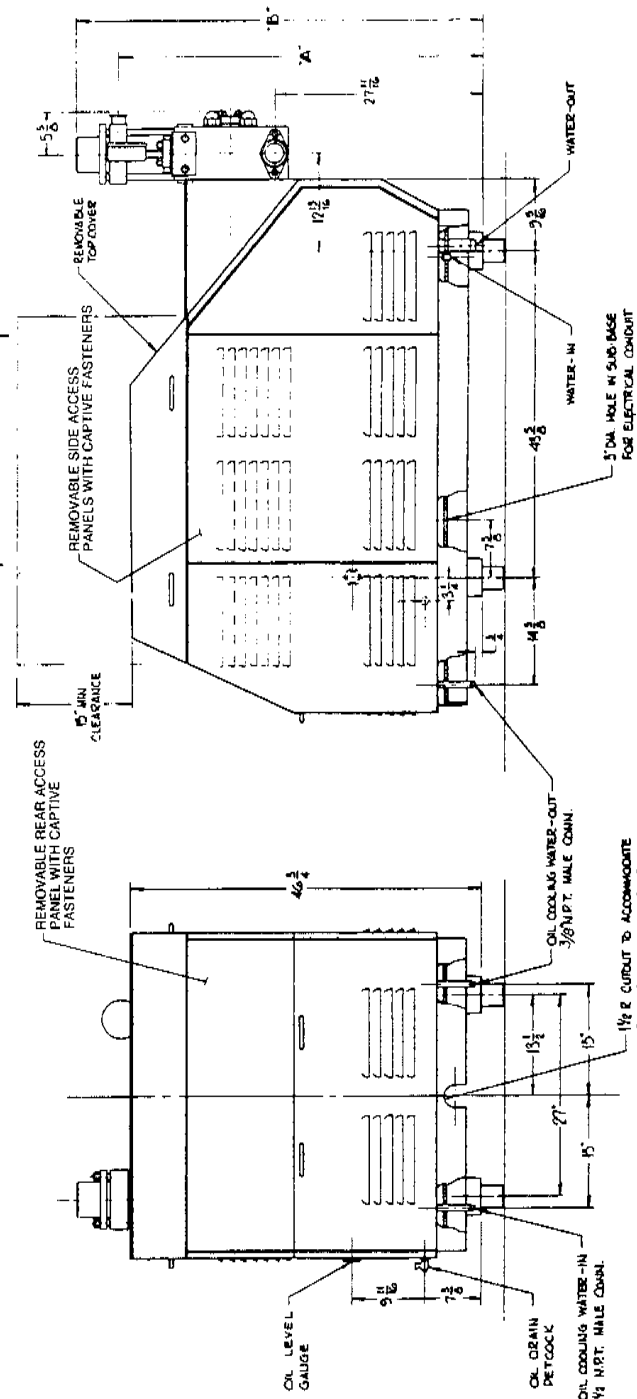
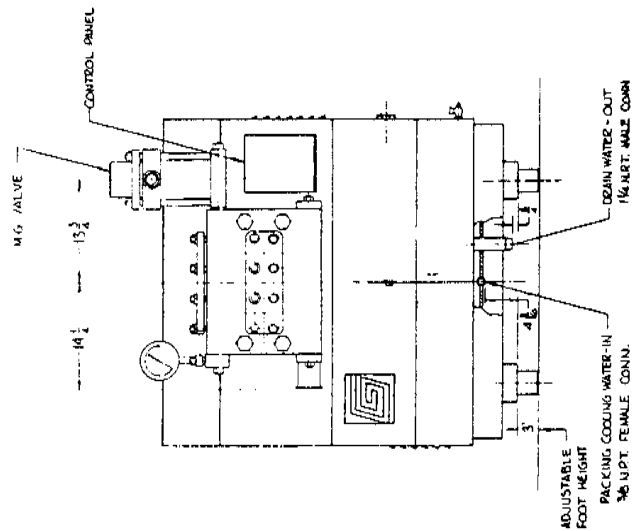
When constructing a piping system, the following guidelines should be considered.

1. Pipelines should not be rigidly anchored to equipment but supported so that they “float”. Pipelines expand and contract with temperature changes and, if rigidly anchored, can damage the system.
2. The lines must be adequately supported to prevent strain on the fittings, valves and equipment connections. Proper supports are an important part of every piping system. The following general rules should be followed.
 - a. Whenever possible, avoid turns, tees and short-radius elbows.
 - b. Straight piping runs should be supported at least every ten feet.
 - c. Supports should be used on each side of every valve, as close to the connection as possible.
 - d. There should be support at each change of the pipeline direction.
3. Where pipelines pass through the walls, floors or ceilings, clearance should be provided around the pipe to allow it to move during expansion and contraction.

1. ALL DIMENSIONS SHOWN ARE NOMINAL & CAN VARY $\pm 1/16"$.
2. CINDER BLOCK IS SYMMETRICAL ABOUT THE VERTICAL & THE W.G. VALVE CAN BE MOUNTED TO EITHER SIDE OF THE BLOCK AS CAN THE INLET CONNECTION



AL ₂ VALVE	A-	B
2 TO 6 STAGES	40 1/2	51 1/2
2 TO 4 STAGES	44 1/2	53 1/2



APV GAULIN, INC.
BASE OUTLINE — MODEL 803
DRAWING D17270

NOTES:

1. ALL DIMENSIONS ARE NOMINAL & CAN VARY $\pm 1/4$ INCH.
2. CYLINDER BLOCK IS SYMMETRICAL ABOUT THE VERTICAL CENTERLINE. M.G. VALVE CAN BE ADJUSTED TO EITHER SIDE OF THE BLOCK AS CAN THE INLET CONNECTION.

2" TRI-CLAMP CONN.-DISCHARGE
CONN. CAN BE ROTATED IN 90°
INCREMENTS ABOUT THE VERTICAL
AXIS. SEE NOTE #2

M.G. VALVE	"A"	"B"
5 TO 10 STAGES	56 3/4	66 1/2
11 TO 15 STAGES	59 1/4	69
16 TO 21 STAGES	62 1/4	72

4" TRI-CLAMP CONN.-INLET
SEE NOTE #2

REMOVABLE REAR ACCESS
PANEL WITH CAPTIVE
FASTENERS

MIN. CLEARANCE
TOP ALL AROUND

REMOVABLE SIDE ACCESS
PANELS WITH CAPTIVE FASTENERS

REMOVABLE COVER
15" MIN. CLEARANCE

CONTROL PANEL

M.G. VALVE

PACKING COOLING
WATER IN 3/4" A.P.T.
FEMALE CONN.

1" ADJUSTABLE
FOOT HEIGHT

DRAIN WATER
OUT 1 1/4" A.P.T.
MALE CONN.

WATER IN

WATER OUT

4 1/2" DIA. HOLE IN SUB-BASE
FOR ELECTRICAL CONDUIT

OIL COOLING
WATER CUT
2 1/2" A.P.T. MALE
CONN.

2 1/2" A.P.T. OUTLET TO ACCOMMODATE
ELEC. CONDUIT THRU BOTTOM

OIL DRAIN
PETCOCK

OIL COOLING
WATER IN
3/4" A.P.T. MALE
CONN.

55 1/2"

36"

15"

16"

11 3/4"

12"

55 1/2"

36"

15"

16"

11 3/4"

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36"

15"

16"

11 3/4"

12"

55 1/2"

36"

15"

16"

11 3/4"

1

SECTION III

THE CYLINDER ASSEMBLY

Introduction

To help understand the following cylinder instructions, please refer to the following drawings:

Model	Cylinder & Parts	Micro-Gap®
		Homogenizing Valve
803	D17132 (End of Section 3)	D17408 & Figures 14/15 (Section 4)
804/805	D17194 (End of Section 3)	D17408 & Figures 14/15 (Section 4)

The pressure gauge shipped with your machine is a delicate instrument and subject to damage through careless handling.

WARNING: The maximum operating pressure of Models 803 and 804 is 1,500 psig (105 kg/cm²). The maximum operating pressure for Model 805 is 1,200 psig (84 kg/cm²). Do not exceed this pressure.

The cylinder block is precision-machined from a single-block forging of 316 stainless steel as standard construction. One end of the piston ports is closed with piston packing assemblies, replaceable cylinder liners and cylinder liner O-rings. The cylinder liners are held in place by a single, flat, rear plate. The other end of the piston ports are closed by front cylinder plugs, which are held in place by a single, front plate.

The valve ports contain the pump valve assemblies and are closed on top by O-rings and top cylinder plugs, which are held in place by a single, flat, top plate.

The top and front plates are identical and interchangeable. The studs and nuts holding the three plates are identical and, therefore, interchangeable.

The suction manifold is bored horizontally through the lower part of the cylinder block and is closed at one end by a gasketed cap. It is fitted at the other end with an inlet connection. These are also interchangeable.

The discharge manifold is bored horizontally through the upper part of the cylinder block. It is fitted at one end for the Micro-Gap homogenizing valve assembly and at the other end for the homogenizing pressure gauge assembly. These are also interchangeable.

All assemblies on the cylinder block must be carefully secured by torquing the nuts to the proper values, as specified in this manual.

Cylinder Disassembly

1. Remove the gauge stud nuts (42) and remove the gauge (40).
2. Remove the gauge block stud nuts (39), gauge block (36), gauge gasket (41) and gauge block gasket (38).
3. Remove the inlet connection stud nuts (32), inlet connection (31) and the gasket (33).
4. Remove the inlet cap stud nuts (46), the inlet cap (34) and the gasket (35).

5. Remove the top plate nuts (22) and top plate (21).
6. Remove the front plate nuts (18) and front plate (17).
7. Remove the top cylinder plugs (23) and front cylinder plugs (19) by using the cylinder plug removal tool (T8). (See drawing C17373.)
 - a. Assemble the slide hammer and nut to the stem of the cylinder plug removal tool.
 - b. Thread the screw end of the stem into the ½", 13 UNC hole in the cylinder plug.
 - c. Rap tool with the slide hammer and remove the cylinder plugs.
8. Remove the top cylinder plug O-rings (24) and front cylinder plug O-rings (20) from the cylinder plugs.
9. Remove the discharge valve springs (11).
10. With the valve removal tool (T7) lift and remove the suction valves (7) and discharge valves (9).
11. Remove the piston and packing assemblies (See drawing C17373.)
 - a. Remove the well cover.
 - b. Rotate the water spray assembly to the vertical position.
 - c. Apply the adjustable wrench (T4) to the "hex" surface at the rear of one of the pistons and turn the piston until the wrench handle lays up against the left sidewall of the well facing the machine. This will prevent the piston assembly from turning while the next step is completed.
 - d. Remove the piston nut (16) at the front of the piston by using the drive handle (T10), drive extension (T11) and piston nut socket (T13).
 - e. Using the wrench already applied to the rear of the piston, apply the open-end adapter wrench (T3) to the flats on the crosshead extension and loosen the threaded connection. Unscrew the piston from the crosshead extension (15).
 - f. Install the piston removal tool adapter (T5) onto the threaded front end of the piston and tighten only finger-tight.
 - g. Install the cylinder plug and piston removal tool (T8) onto the adapter (T5) and carefully remove the piston assembly, making sure that it does not nick or groove the cylinder liner.
 - h. Unscrew the adapter and piston removal tools and remove the packing retainer ring (14), packing (13) and the packing adjusting ring (44).
 - i. Repeat this process with the remaining pistons.
12. Remove the cylinder liners and seals:
 - a. Remove the back plate nuts (26) and the back plate (25).
 - b. Remove the cylinder liners (27) from the rear of the cylinder by inserting the cylinder liner removal tool (T9) into the front cylinder port against each cylinder liner and tapping gently with a mallet to loosen and remove.
 - c. Inspect the inside diameter of each cylinder liner for deep scoring or other damage. Replace as required.
13. Pump valve seat removal — See Maintenance, Section 6.
14. Cylinder studs — See Maintenance, Section 6.

Cylinder Reassembly

Clean all parts thoroughly. Use brushes. Do not use metal brushes, metal sponges or other abrasive aids on cylinder parts. Be careful to prevent metal parts from striking each other or other objects.

Lubricate all threads with a food-grade lubricant before reassembling. Repeat this procedure on assembly for the first few times to prevent galling.

1. With the valve removal tool (T7) install the suction valves (7) and discharge valves (9).
2. Lubricate the cylinder liner O-ring gaskets (28) with a food-grade lubricant and install on the cylinder liners (27).
3. Carefully place the cylinder liners (27) with cylinder liner O-rings (28) in the rear of the cylinder bores.
4. Install the back plate (25) and back plate nuts (26). Refer to Figure 3 for proper nut-tightening sequence.

NOTE: Maximum life of the back plate studs can only be attained if the proper nut-tightening sequence is followed and the proper torque values are applied.

- a. Finger-tighten nuts.
- b. Secure the nuts lightly and evenly with a wrench.
- c. Torque the nuts evenly to 125-150 ft. lbs.

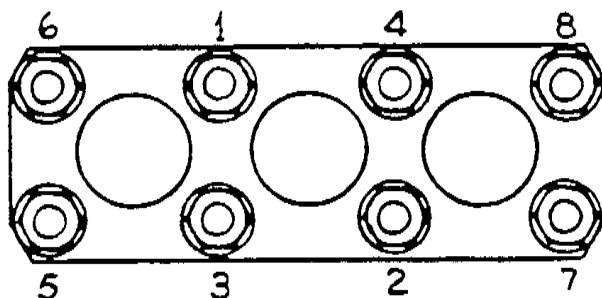


FIGURE 3

5. Assemble the piston and packing assemblies, as follows. (See appropriate cylinder drawing.)
 - a. Lubricate a packing adjusting ring (3) with a food-grade lubricant and install it onto a piston (12), making sure that the flat surface of the ring faces the shoulder on the piston.
 - b. Lubricate and install one piston packing ring (13), making sure that the convex side of the ring nests into the concave side of the packing adjusting ring.
 - c. Install the packing retainer ring (14), making sure that the convex side of the ring nests into the concave side of the piston packing ring (13). The smooth side of the retainer ring will face forward. Check to make sure that the retainer ring fits over the boss on the face of the piston.
 - d. Install and *lightly* finger-tighten the piston nut (16). Light tightening will ensure that the packing ring is not expanded and will enable the piston to be easily fitted into the cylinder liner.
 - e. Carefully slide the piston assembly into the cylinder liner, until the piston's threaded end comes into gentle contact with the crosshead extension (15).
 - f. Rotate the crosshead extension to engage the threads.
 - g. Using only the open-end wrench (T3) on the flats of the crosshead extension, rotate the crosshead extension until the handle of the wrench lays up against the right sidewall of the well (facing the machine). This will prevent the crosshead extension from turning during the following step.

- h. Using the piston nut socket (T13), extension (T11) and drive handle (T10), tighten the piston nut to approximately 150 ft. lbs. This procedure will serve to tighten both the piston nut and the piston/crosshead extension connection to the proper torque value.
 - i. Repeat the process with the other piston assemblies.
6. Cylinder Plug Installation Procedure—
- a. Lubricate the cylinder plug O-rings (20 and 24) with a food-grade lubricant and install on the cylinder plugs (19 and 23).
 - b. Assemble plug removal tool (T8) to top cylinder plugs (23) or front cylinder plugs (19).
 - c. When installing the top plugs (23), be sure that each plug stem is inserted into the discharge valve spring (11), which should be located, upright and centered, on top of the discharge valve (9).
 - d. Check the lead-in chamfer of each plug as it enters the cylinder.
 - e. Set the plugs squarely into the cylinder holes and tap each plug lightly past its lead-in chamfer with tool (T8).
 - f. Remove tool (T8) from plug.
 - g. Lubricate all studs, install the top plate (21), the top plate nuts (22), the front plate (17) and front plate nuts (18). Refer to Figures 4 (Model 803) or 5 (Models 804/805) for nut-tightening sequence.

NOTE: Maximum life of top and front plate studs can only be attained if the proper nut-tightening sequence is followed and the proper torque values applied.

1. Finger-tighten nuts.
2. Secure nuts lightly and evenly.
3. Torque nuts evenly to 125-150 ft. lbs.

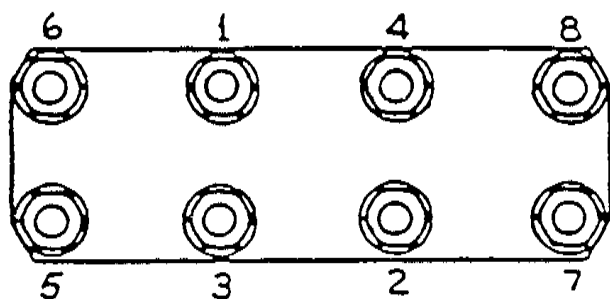


FIGURE 4

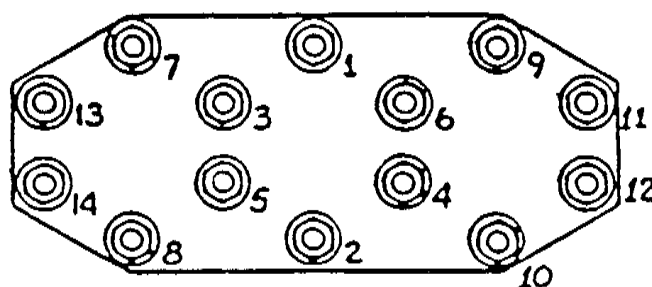


FIGURE 5

7. Install the inlet connection gasket (33) and assemble the inlet connection (31) to the cylinder.
8. Replace the inlet connection nuts (32). Tighten the nuts evenly and firmly to compress the gasket and prevent leakage.
9. Install the inlet cap gasket (35) and assemble the inlet cap (34) to the cylinder. Replace the inlet cap stud nuts (46). Tighten the nuts evenly and firmly to compress the gasket and prevent leakage.

10. Install the gauge block gasket (38) and assemble the gauge block (36) to the cylinder. Replace the gauge block stud nuts (39). Tighten the nuts evenly and firmly to compress the gasket and prevent leakage.
11. Install the gauge gasket (41) and gauge (40) to the gauge block (36). Replace the gauge stud nuts (42). Tighten the nuts evenly and firmly to compress the gasket and prevent leakage.
12. Lower the water spray assembly to the normal, horizontal position. At this point, check the flow and aim of the spray nozzles on the water spray assembly. If one or more of the nozzles has become clogged or misaligned during cylinder disassembly/reassembly, piston cooling water starvation will result; the piston packing assemblies will rapidly deteriorate, and the cylinder liners may become damaged. (See Maintenance Section and Figure 15.)
 - a. Turn on and adjust the flow of water to the water spray assembly, so as to attain a steady stream.
 - b. Make sure that the spray nozzles are flowing evenly. A clogged nozzle can usually be freed by working a thin piece of wire into the end of the nozzle.
 - c. The stream of water from each nozzle, when the water spray tube is properly adjusted in the horizontal position, should be aimed so that all of the stream enters the mouth of the cylinder liner, near the inner top surface of the liner.
13. Replace well cover.

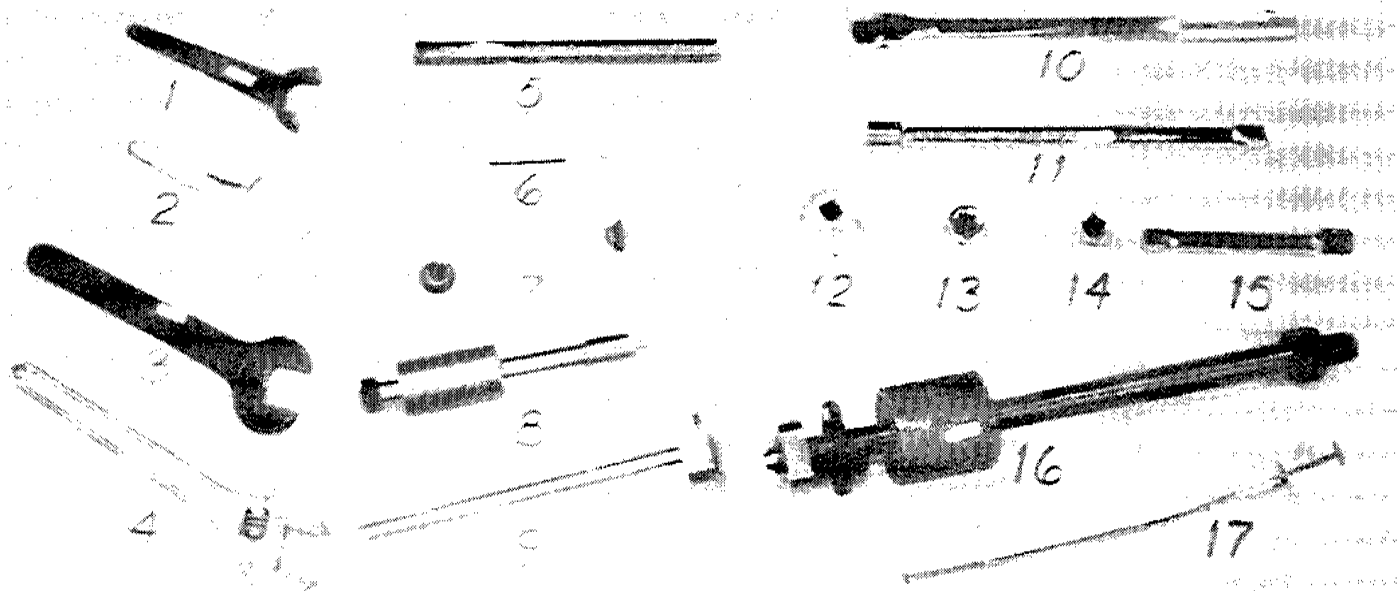


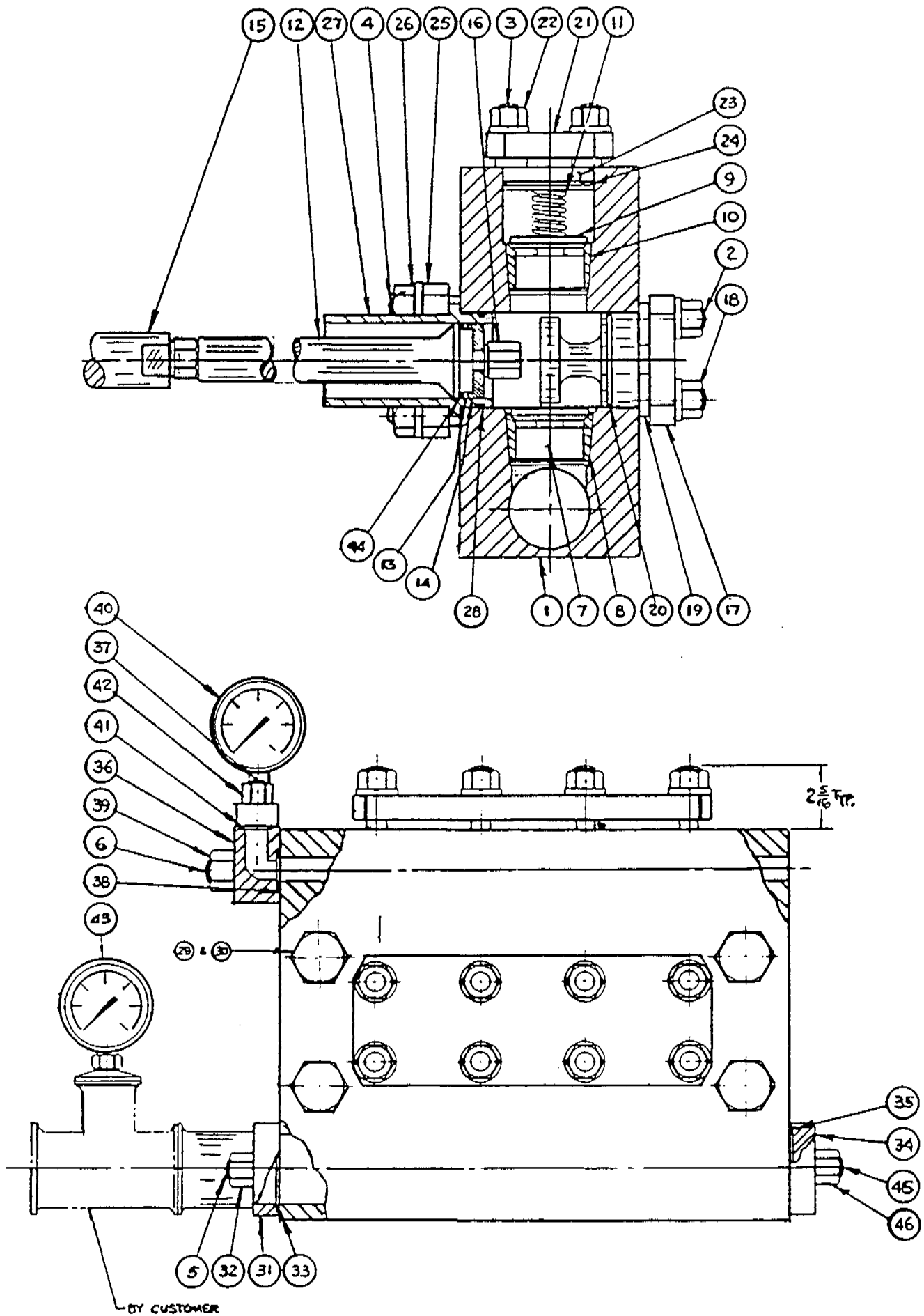
FIGURE 6
TYPICAL TOOLS SUPPLIED

T1	Crosshead Bearing Tool	T10	Drive Handle
T2	Baffle Packing Gland Wrench	T11	Drive Extension
T3	Open-End Wrench	T12	Cylinder Nut Socket
T4	Adjustable Wrench	T13	Piston Nut Socket
T5	Piston Removal Tool Adaptor	T14	Plate Nut Socket
T6	Baffle Packing Removal Tool	T15	Drive Extension
T7	Valve Removal Tool	T16	Valve Seat Removal Tool Assembly
T8	Cylinder Plug & Piston Removal Tool	T17	Pick-Up Tool
T9	Cylinder Liner Removal Tool		

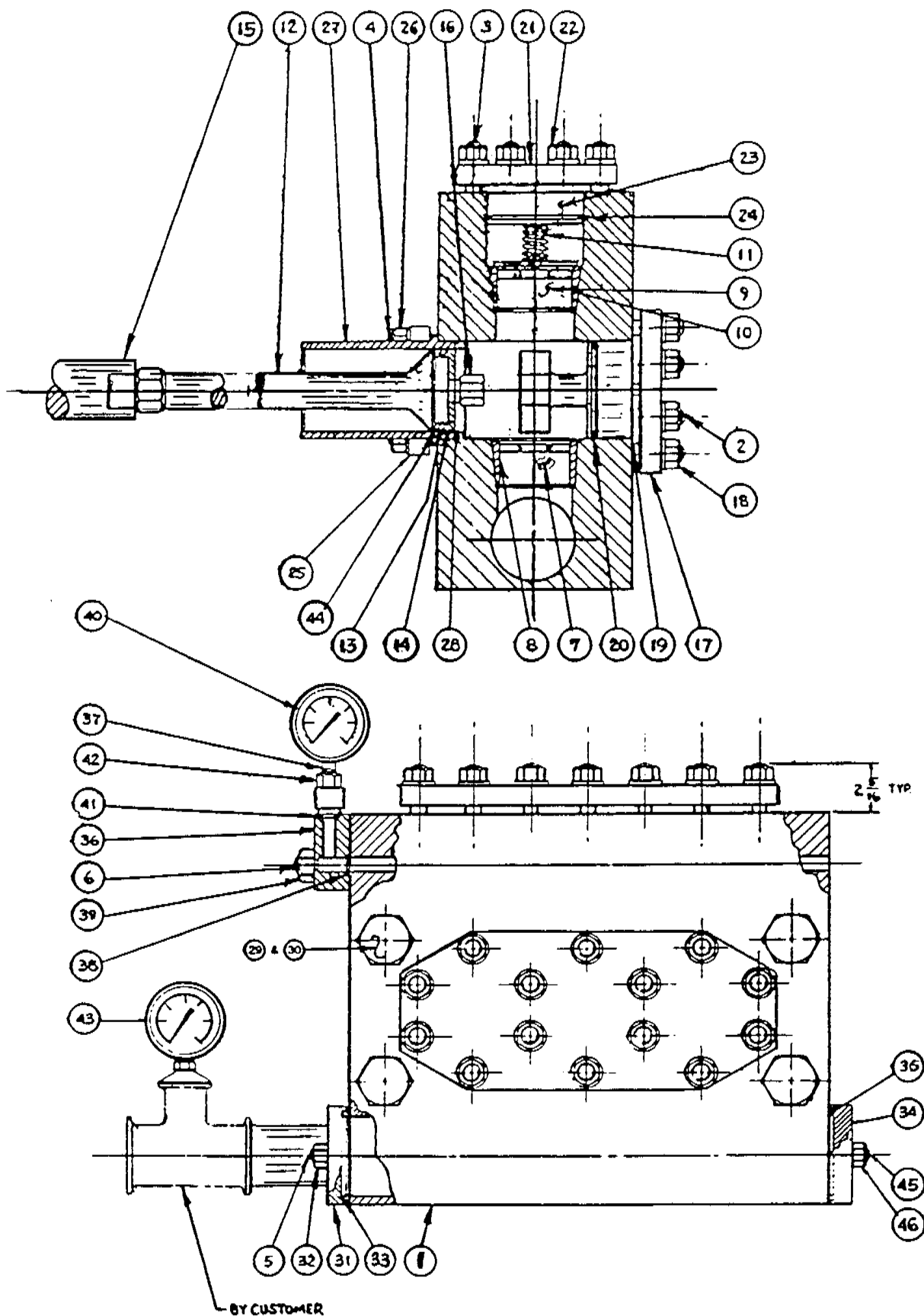
NOTE: Also see drawing, C17373, at end of this section.

FIGURE 7
CYLINDER PARTS LIST

ITEM	QTY.		ITEM	QTY.		ITEM	QTY.	
1	1	CYLINDER BLOCK	16	3	PISTON NUT	31	1	INLET CONNECTION
2	8/14	FRONT PLATE STUD	17	1	FRONT PLATE	32	2	INLET CONNECTION NUT
3	8/14	TOP PLATE STUD	18	8/14	FRONT PLATE NUT	33	1	INLET CONNECTION GASKET
4	8	BACK PLATE STUD	19	3	FRONT PLUG	34	1	INLET CAP
5	2	INLET CONNECTION STUD	20	3	FRONT PLUG O-RING	35	1	INLET CAP GASKET
6	2	GAUGE BLOCK STUD	21	1	TOP PLATE	36	1	GAUGE BLOCK
7	3	SUCTION VALVE	22	8/14	TOP PLATE NUT	37	2	GAUGE STUD
8	3	SUCTION VALVE SEAT	23	3	TOP PLUG	38	1	GAUGE BLOCK GASKET
9	3	DISCHARGE VALVE	24	3	TOP PLUG O-RING	39	2	GAUGE BLOCK STUD NUT
10	3	DISCHARGE VALVE SEAT	25	1	BACK PLATE	40	1	GAUGE WITH FLANGE
11	3	DISCHARGE VALVE SPRING	26	8	BACK PLATE NUT	41	1	GAUGE GASKET
12	3	PISTON	27	3	CYLINDER LINER	42	2	GAUGE STUD NUT
13	3	PISTON PACKING RING	28	3	CYLINDER LINER O-RINGS	43	1	INLET MANIFOLD GAUGE
14	3	PACKING RETAINER RING	29	4	CYLINDER STUD	44	3	PACKING ADJUSTING RING
15	3	CROSSHEAD EXTENSION	30	4	CYLINDER STUD NUT	45	2	INLET CAP STUD
						46	2	INLET CAP NUT

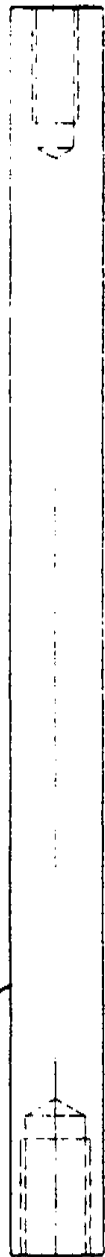


MODEL 803 CYLINDER
DRAWING D17132



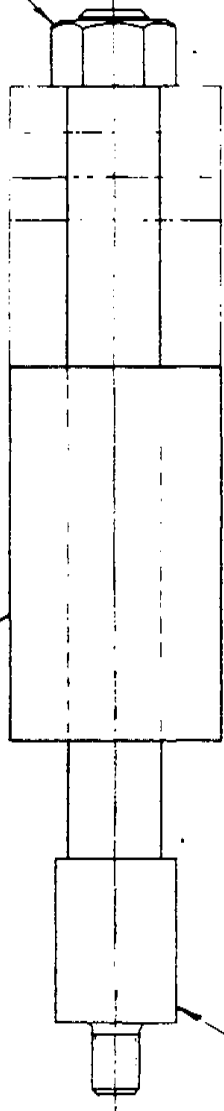
MODEL 804/805 CYLINDER
DRAWING D17194

①
ADAPTER - 373954



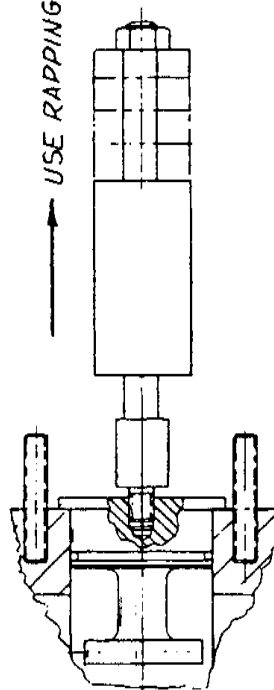
HANDLE - 376110

NUT - 823012



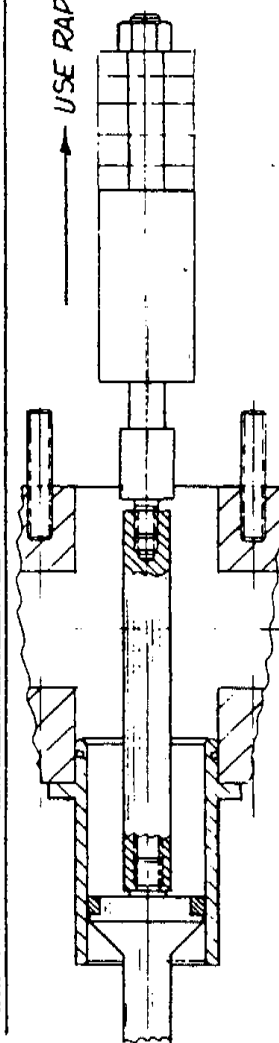
STEM - 375120

CYLINDER PLUG & PISTON REMOVAL TOOLS



→ USE RAPPING MOTION TO REMOVE

-CAP PLUG REMOVAL



→ USE RAPPING MOTION TO REMOVE

PISTON REMOVAL

APV GAULIN, INC.
CAP-PLUG & PISTON REMOVAL TOOLS
DRAWING C17373

SECTION IV

THE MICRO-GAP® HOMOGENIZING VALVE

Introduction

Through extensive experimentation at APV Gaulin, it has been found that homogenization efficiency can be greatly increased, if a certain valve geometry is used and specific fluid flow conditions are met. The basic concept involves the transfer of homogenizing energy to the fluid in the shortest time and with the greatest energy density possible.

The APV Gaulin Micro-Gap homogenizing valve achieves this result with a knife-edge design which maintains an extremely small opening between the valve and seat, thereby generating a thin film of processed fluid. The valve seat geometry has a very narrow travel distance from the high pressure fluid side to the low pressure fluid side, thereby producing a large pressure differential in a very short time over a very short distance. This pressure change in the fluid film produces intense cavitation and turbulence in the liquid. The flow condition through the narrow gap is also affected by the backpressure on the downstream side of the valve. By adjusting the amount of this backpressure the cavitation intensity can be maximized in the fluid film. By combining these elements of narrow land a very high energy density can be applied to the fluid being homogenized.

Conventional homogenizing valves usually consist of a single valve and seat, which create a small opening through which pressurized fluid flows. As the rate of flow increases, the size of the opening must also increase in order to maintain pressure and accommodate flow. At high flow rates the cross-sectional area must be very large, and this can be accomplished by either increasing the diameter of the valve and seat so that the gap is small but the circumference is large. However, when the gap is large, homogenizing efficiency is decreased.

The Micro-Gap homogenizing valve overcomes these limitations by stacking the valves in parallel and by allowing the flow to be split into equal parts, such that each part of the flow is simultaneously subjected to the ideal conditions of homogenization. Each valve member acts as both a valve and valve seat. The valve seat has the knife-edge configuration. Because the number of valve members can be varied, a large flow of liquid can be efficiently homogenized by dividing the total flow of product into the correct number of parts, so that each part goes through one valve member at the correct gap and flow conditions. With this stacked configuration the flow can be increased without sacrificing homogenizing efficiency, because each valve member always works on the same rate of flow at the same fluid conditions.

The APV Gaulin Micro-Gap homogenizing valve has been designed for use on dairy products. The increased homogenizing efficiency of the Micro-Gap valve over conventional valves and the ability to retain excellent homogenizing efficiency, even at very high flow rates, results in considerable energy savings. The homogenizing pressure can be lowered significantly using the valve, and the quality of the emulsion will be equivalent to what was previously obtained using a conventional homogenizing valve.

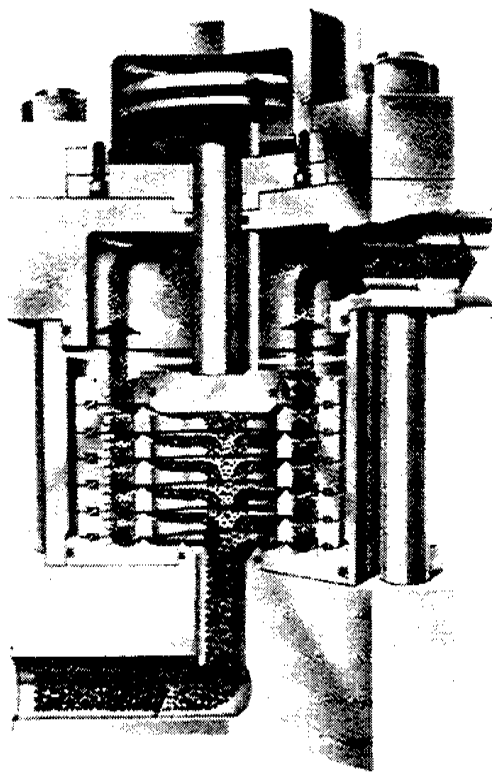


FIGURE 8
THE MICRO—GAP® HOMOGENIZING VALVE

APV Gaulin has developed the EQA™, which can be used to accurately and quickly determine emulsion quality. It is strongly recommended that the EQA be utilized by all processing plants having homogenizers equipped with Micro-Gap homogenizing valves.

Installation of Micro-Gap Valve Assembly

1. Refer to drawings D17408, D17477 and Figure 9.
2. The Micro-Gap homogenizing valve assembly consists of two major sub-assemblies: the HVA mechanism and the Micro-Gap valve assembly with related parts. The entire assembly weighs 50 to 100 lbs., depending on the number of valves.
3. After initial run-in of the machine at the Factory, the Micro-Gap valve assembly is removed from the cylinder, inspected, cleaned and assembled complete with all parts required for operation, as per the customer order. The complete Micro-Gap homogenizing valve assembly has been packed in a separate carton for shipping. This carton will be found in the motor compartment of the machine.
4. For proper installation on the homogenizer carefully slide the entire assembly onto the inlet flange studs (23). Locate the assembly so that it stands upright with the inlet flange (1) located at the bottom. With the gasket (2) in place, slide the assembly fully onto the studs, taking care not to damage stud threads. Install the stud nuts (24) and tighten evenly and firmly to compress the gasket and prevent leakage.
5. Although the Micro-Gap homogenizing valve assembly (including the HVA mechanism) is shipped assembled, it is recommended that you disassemble the Micro-Gap valve components in order to check the number and alignment of the various parts, which could have become misaligned due to possible shipping mishandling, and to better familiarize yourself with its unique but simple design.

6. To complete the installation connect the hydraulic line at the Hansen quick-disconnect coupling. The hydraulic system must then be vented in accordance with the steps shown under "Reassembly of Micro-Gap Valve Components".

Disassembly of Micro-Gap Valve Components

Using a rubber mat, carefully lay out all of the parts to avoid any chance of bumping, scraping or nicking.

1. Refer to drawings D17408 and D17477.
2. Set the HVA reducing control valve (on control panel) to "0" psig and turn off the HVA pump.
3. Disconnect the product discharge piping.
4. Remove the four Micro-Gap valve assembly stud nuts (26).
5. Remove the actuator body clamp (29).
6. Lift the HVA mechanism (28) straight up and remove from the discharge flange assembly (11).
NOTE: Slits are machined 1/8" deep in the inlet flange (1) and the discharge flange (11) to provide suitable places to gently pry off the discharge flange and/or the Micro-Gap valve body, if those parts are stuck on the gaskets.
7. Remove the discharge flange assembly and then carefully remove the Micro-Gap valve body (5) straight up, so as not to disturb the Micro-Gap valve stack.
8. Remove the top Micro-Gap valve (8) with plug (9), all of the Micro-Gap valves and springs (8 and 10) and the Micro-Gap base valve (6).
9. Remove the valve plug (9) and O-ring (30) from the top valve.
10. All parts, including the various O-rings, can now be inspected.

Reassembly of Micro-Gap Valve Components

1. Refer to drawings D17408, D17477 and Figure 9.
2. Use a suitable food-grade lubricant on all O-ring gaskets, prior to installation.

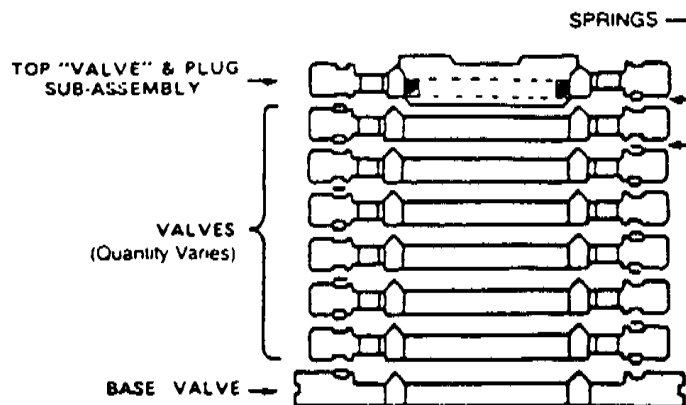


FIGURE 9

3. If the inlet flange (1) was removed from the cylinder during disassembly, mount the inlet flange over the two inlet flange studs (23) using the inlet flange gasket (2) and secure tightly in place with the two inlet flange stud nuts (24). Tighten the nuts evenly and firmly to compress the gaskets and prevent leakage.
4. Install the inlet back-up ring (4) (concave side up), the inlet flange O-ring (3) in the concave side, and the Micro-Gap base valve (6) along with the Micro-Gap base valve O-ring (7).
5. Examine the "This Is Your Machine" sheet enclosed with the manual supplied with the machine to ensure that you have the proper number of Micro-Gap valves (8), top valve plug (9) and valve springs (10) for your assembly.

<p>CAUTION: If the Micro-Gap valve assembly is assembled with fewer or more Micro-Gap valves or valve springs than specified, extensive damage may result.</p>

6. Working upwards from the base valve, carefully stack up in position the proper number of Micro-Gap valves and valve springs specified, *excluding* any spares supplied. Be sure that the knife edge of each valve faces up. Use one valve spring in the groove between each valve with the spring split facing down. Be sure that the valve springs fit securely in the mating grooves.
7. Install O-ring (30) on top valve plug (9) and install into the valve plate.
8. Carefully slide the Micro-Gap valve body (5) straight down over the valve stack. Make sure that the valve stack is not disturbed or knocked out of position during this operation.
9. Install the discharge flange assembly (11) with the discharge flange O-ring (14) and actuator rod O-ring (19). For installation convenience the discharge flange assembly may be rotated by 90° increments to line up with the system piping.
10. To install the HVA mechanism loosen but do not remove the vent plug (27) located at the top of the HVA body (28).
11. Install the HVA mechanism straight down and over the four Micro-Gap valve assembly studs (25) and position so that the hydraulic fluid supply fitting is aligned with the hydraulic line and Hansen coupling.
12. Install the actuator body clamp (29).
13. Connect the hydraulic line at the Hansen coupling.
14. Check to insure that the vent plug (27) is still loosened.
15. Tighten the Micro-Gap valve assembly nuts (26).

NOTE: Prior to operation, the HVA oil tank must be filled with the oil supplied.

16. Start the HVA pump motor (push/pull switch on the control panel) and set the HVA reducing control valve (also on control panel) to approximately 200 psig in order to fill the HVA body with hydraulic fluid.
17. Vent all air from the HVA lines and actuator. Tighten the vent plug (27), reduce the HVA pressure to "0" and turn off the pump motor. The Micro-Gap valve assembly is now ready for connection to product piping.
18. Referring to Figure 10, install the tee, gauge and restrictor backpressure control, if supplied with your machine.
19. Connect the product piping.
20. Your Micro-Gap homogenizing valve is now ready for operation.

Disassembly of the HVA Mechanism

If oil begins to leak out between the actuator body clamp and the discharge flange assembly, the HVA O-ring is leaking and should be replaced along with the back-up ring. Refer to drawings D17408 and D17477.

1. Set the HVA reducing control valve (on control panel) to "0". Turn off the HVA pump.
2. Disconnect the HVA hydraulic line at the Hansen coupling.
3. Remove the Micro-Gap valve assembly stud nuts (26).
4. Remove the actuator body clamp (29).
5. Lift the HVA mechanism straight up to remove from the discharge flange assembly (11).
6. Remove the two Allen-head, actuator body screws (22) from the base of the assembly and remove the actuator guide plate (15). The actuator guide plate contains a guide plate bushing (16) which does not normally require disassembly.
7. Loosen but do not remove the vent plug (27) located at the top of the actuator body (28).
8. Grasp the actuator rod (18) by hand and pull the assembly out of the actuator body. The actuator body will contain some oil, which must be disposed of.

CAUTION: Do not place the HVA rod (18) in a vise to aid in disassembly. Irreparable damage to the rod could result.

9. Remove the actuator rod O-ring (21) and the back-up ring (20). Inspect and replace as necessary.

Reassembly of the HVA Mechanism

Refer to drawings D17408 and D17477.

CAUTION: Do not place the HVA mechanism rod (18) in a vise to aid in assembly. Irreparable damage to the rod could result.

1. Install a back-up ring (20) on the actuator rod, so that the concave surface of the ring faces the oil side.
2. Install an actuator rod O-ring (21) ABOVE the back-up ring, so that the bottom of the O-ring seats in the concave surface of the back-up ring.
3. Loosen but do not remove the vent plug (27) located at the top of the actuator body (28).
4. Using a suitable lubricant, such as petroleum jelly or HVA oil, lubricate the O-ring and the inside of the actuator body.
5. Using hand force and a twisting motion, install the actuator rod assembly into the actuator body.
NOTE: Any damage caused to the O-ring through the use of excessive force or sharp tools during this operation will result in leakage.
6. Install the actuator guide plate (15), so that the large pilot goes into the actuator body, as show in the drawing.
7. Install and tighten the two Allen-head actuator body screws (22).
8. Prior to installing the HVA mechanism into the Micro-Gap valve assembly, check to see that the vent plug is still loose and then push the actuator rod (18) until fully retracted into the actuator body (28).
9. To install the HVA mechanism on the Micro-Gap valve assembly, carefully slide the HVA mechanism straight down and over the four Micro-Gap valve assembly studs (25).

10. Install the actuator body clamp (29).
11. Connect the hydraulic line at the Hansen coupling. Rotate the Hansen coupling and the actuator body, as needed.
12. Check to ensure that the vent plug is still loosened.
13. Install and tighten evenly the four Micro-Gap valve assembly stud nuts (26).

NOTE: Prior to operation, the HVA oil tank must be filled with the oil specified. (See Section II — HVA System Oil.)

14. Start the HVA pump motor (push/pull switch on the control panel) and set the HVA reducing control valve (also on the control panel) to approximately 200 psig in order to fill the HVA body with hydraulic fluid.
15. Vent all air from the HVA lines and actuator. Tighten the vent plug, reduce the HVA pressure to “0” and turn off the pump motor. The Micro-Gap valve assembly is now ready for connection to product piping.
16. The system relief valve is located at the rear of the machine on the equipment service panel, bottom right side, and the system pressure gauge is located on the right side in the HVA pump discharge piping. It is a 0-2,000 psig (141 kg/cm²) gauge. The relief valve is preset at the Factory. However, if it becomes necessary to reset the relief valve, see the Maintenance Section.

Micro-Gap Valve Discharge Piping and Back-Pressure Control

Figures 10, 11 and 12 illustrate several methods for achieving the desired amount of backpressure required to effectively operate the Micro-Gap homogenizing valve assembly.

NOTE: When using the flow restrictor shown in Figure 16, it is necessary to extend the outlet pipe 12 to 18 inches beyond the flow restrictor, before installing an elbow or tee in the discharge line. This will help to reduce any noise or vibration in the line caused by the high velocity flow through the flow restrictor.

RESTRICTOR BACKPRESSURE CONTROL

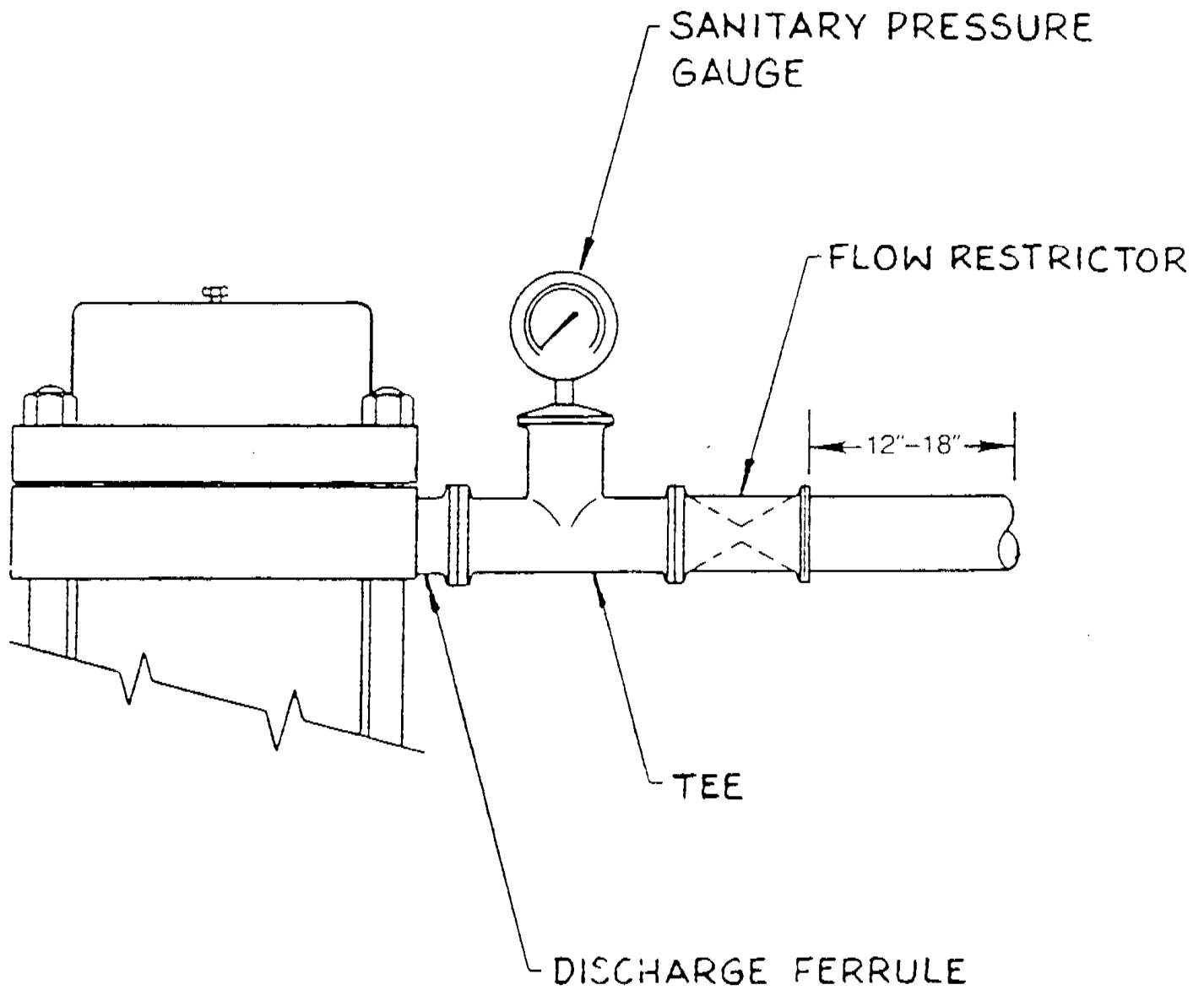


FIGURE 10

AUTOMATIC AIR OPERATED BACK PRESSURE CONTROL FOR VARIABLE-CAPACITY OPERATION.

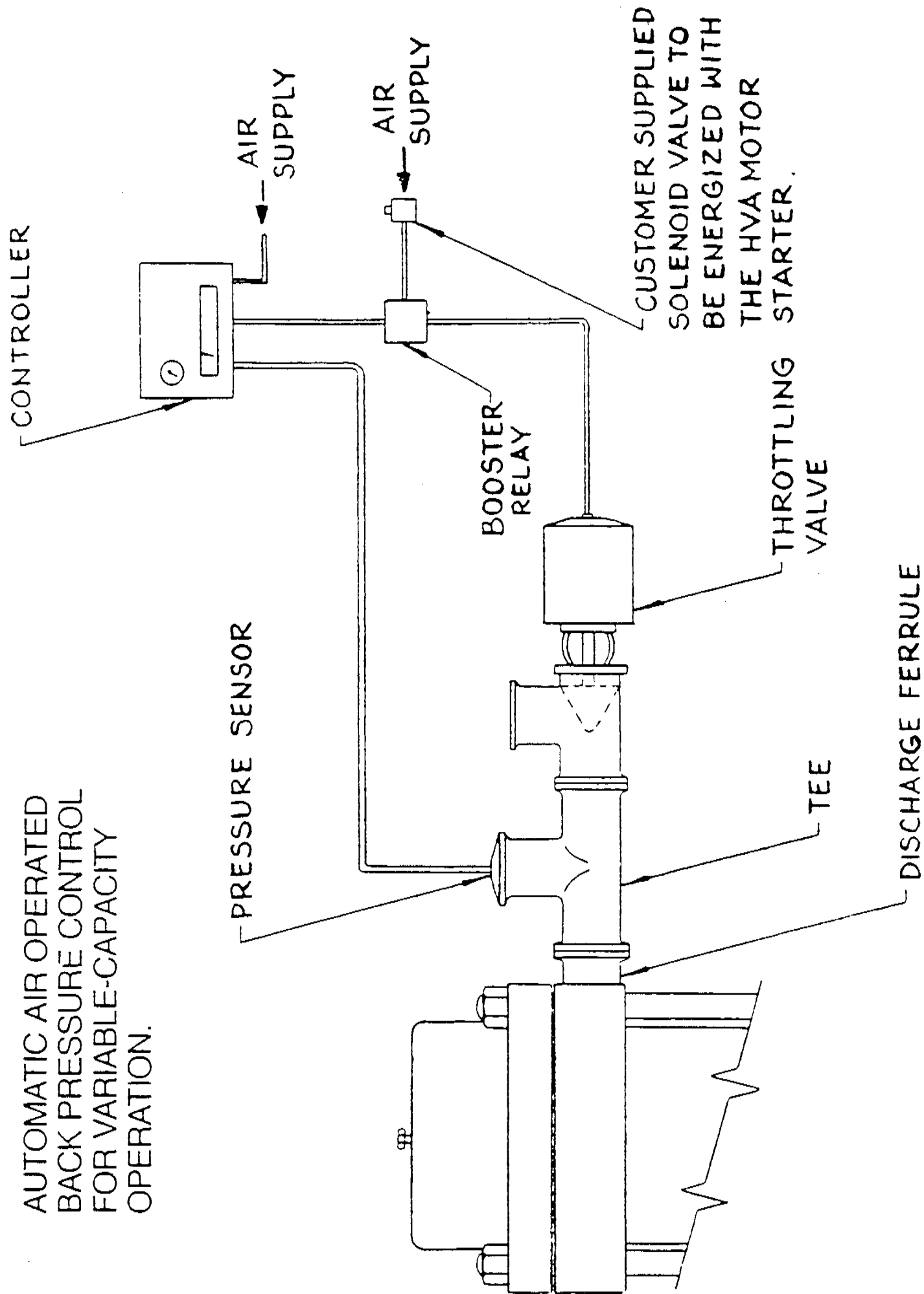


FIGURE 11

MANUAL AIR-OPERATED
BACK PRESSURE CONTROL
FOR VARIABLE-CAPACITY
OPERATION.

SANITARY GAUGE

AIR REGULATOR VALVE
WITH GAUGE

AIR
SUPPLY

CUSTOMER-SUPPLIED
SOLENOID VALVE TO BE
ENERGIZED WITH THE
HVA MOTOR STARTER

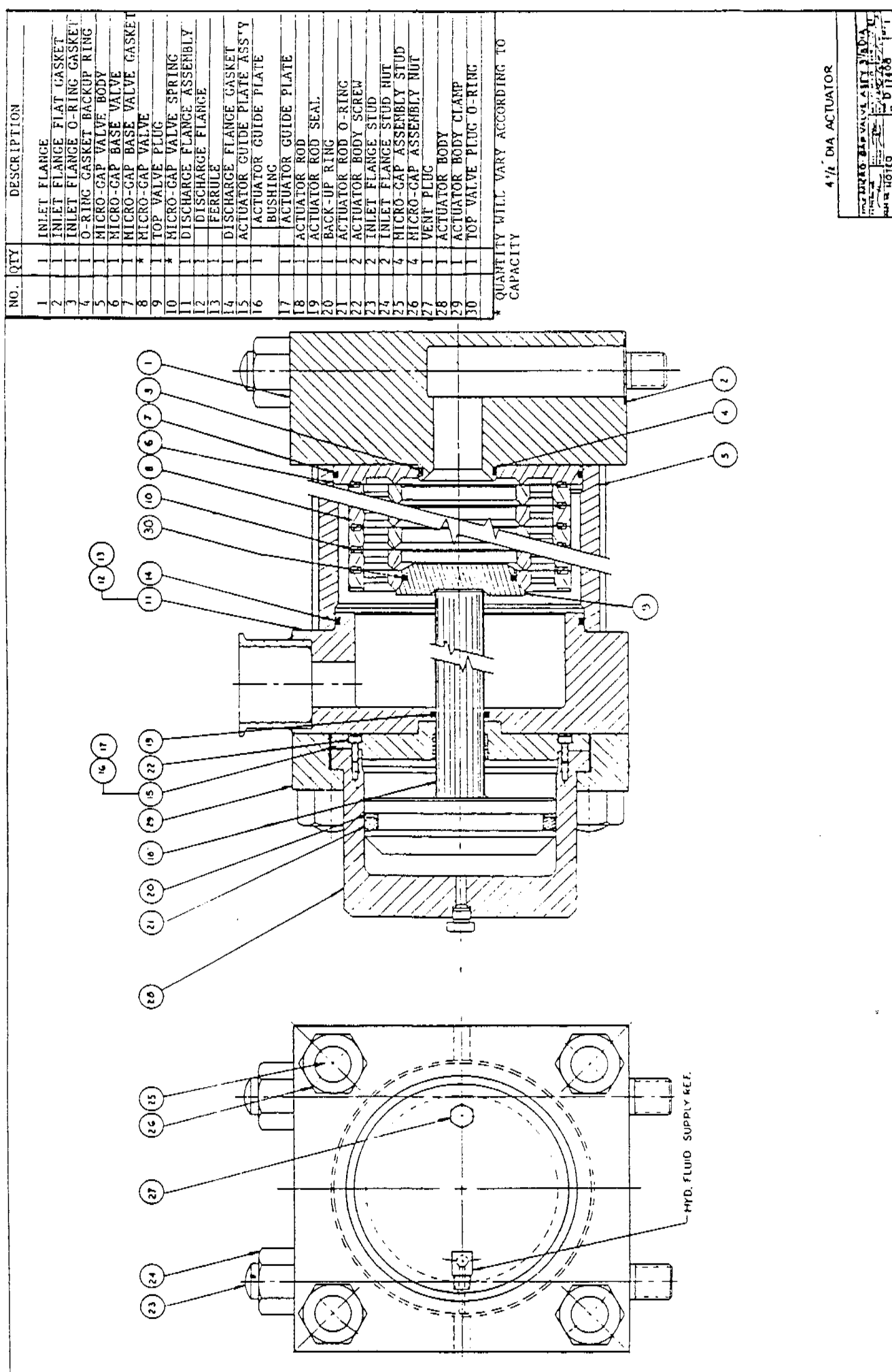
THROTTLING
VALVE

TEE

DISCHARGE FERRULE

SEP

FIGURE 12



4 1/2 DIA ACTUATOR

MANUFACTURED BY	VALVE	4 1/2 DIA
DATE	10/10	10/10
REV	1	10/10

SECTION V

HOMOGENIZER OPERATION

TEST OPERATION

This is the opportune time to construct a pressure/amperage curve to facilitate future, occasional check-out of gauge accuracy in the event that the gauge fails. It is a simple procedure. Merely record on the accompanying graph (Figure 13) three or four pressure gauge readings up to the maximum operating pressure for the machine, as well as the corresponding amperage reading determined by your electrician as each of the pressures are reached and recorded. Future amperage readings should correspond with the pressures indicated by the gauge.

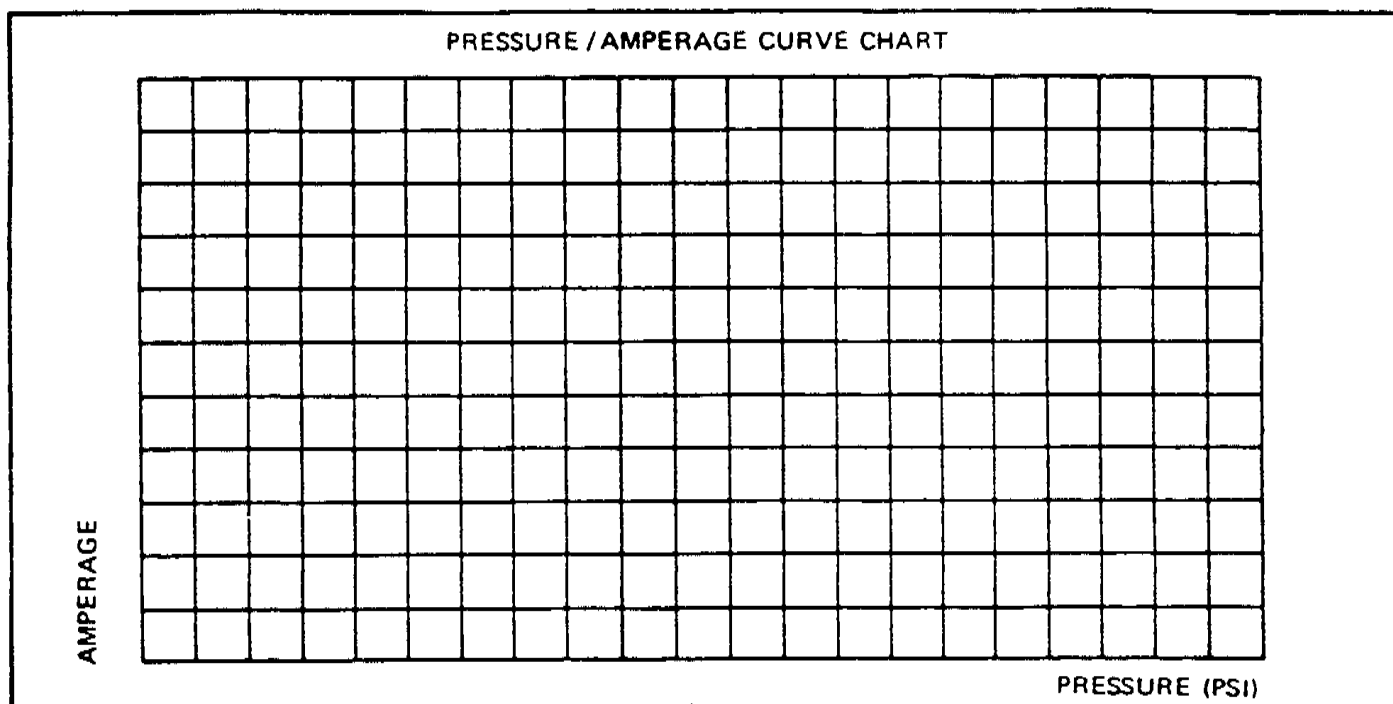


FIGURE 13

Any foreign matter in the product piping or water supply must be flushed out, before the system is put into operation.

Turn on the water for the water-spray assembly, which cools the piston packing assemblies, and adjust the flow using the control valve. Turn on the separate water line for cooling the power-end and HVA oil coolers.

Prior to initiating test operation, the operation of the low oil pressure cut-out switch, as well as the flow and aim of the water-spray nozzles should be checked.

Clean water should be used for initial testing of the homogenizer. During the water test run, a capacity check should be made at normal homogenizing pressure to determine if the machine is operating at its rated flow. See Section VII for procedure to conduct a capacity check.

Various products being homogenized may require more infeed pressure than that required for water. It is recommended that the required infeed pressure be determined for each different product processed and notes taken to enable the operator to set up the required pressure whenever changing the product.

CONSTANT REQUIREMENTS

No matter where the homogenizer is located, efficient and safe operation demands the following.

1. Homogenizing temperature must be 140°F (except evaporated milk).
2. Minimum infeed pressure about 10 psig or greater must be maintained, as indicated by product temperature, viscosity and flow rates.
3. Air entrainment in product must be kept to absolute minimum possible (2% or less) to avoid serious damage from shock loading.
4. Do not start machine under pressure.
5. Do not apply pressure until machine is pumping smoothly with air expelled from cylinder and infeed lines.
6. Uninterrupted product supply is required. Machine should not be operated with pressure applied while product runs out.

STARTING THE MACHINE

1. Start the homogenizer on water and allow the machine to run until full flow has been achieved.
2. Start the HVA pump motor.
3. Turn the reducing valve control knob counter-clockwise, until the hydraulic pressure gauge (located on the panel above the knob) comes to rest at approximately zero.
4. Adjust the HVA pressure by turning the reducing valve control knob clockwise, until total desired homogenizing pressure is indicated on the homogenizer pressure gauge.

NOTE: Models 803 and 804 homogenizers are designed and manufactured for maximum operating pressures up to and including 1,500 psig (105 kg/cm²). Model 805 is designed for maximum operating pressure of 1,200 psig (84 kg/cm²). Do not exceed the safe design pressure of the homogenizer, as specified in the front of your operation manual and on the homogenizer nameplate (located in the well area of the machine's power-end).

5. If a flow-restrictor device is used, the backpressure (indicated on the backpressure gauge) must be 10 to 15% of the total homogenizing pressure. For example, if the homogenizing pressure desired is 1,200 psig (84 kg/cm²), the backpressure must be 120 to 180 psig (8.4 to 12.7 kg/cm²).
6. If an air-actuated valve is used, as with a variable-speed motor, set the air pressure to obtain 10 to 15% on the backpressure gauge.
7. The Micro-Gap valve assembly has been fitted with 3-1/8" diameter Micro-Gap valves and a 4 1/2" HVA. The HVA pressure needed is about 50% of the homogenizing pressure desired. For example, it should require about 600 psig (42 kg/cm²) to obtain 1,200 psig (84 kg/cm²) homogenizing pressure.
8. Reset the HVA system relief valve to 200 psig (14 kg/cm²) above the required HVA pressure. (See Maintenance Section for procedure.)
Note: Monitor both the main homogenizing pressure and the back pressure gauges, per normal plant practice.
9. Turn the reducing valve knob counter-clockwise until the HVA pressure gauge at the control panel comes back to minimum position. The HVA system pressure indicated at the rear of the machine should remain constant for all product pressures.
10. Reduce HVA pressure to the minimum point.
11. Shut off the HVA motor and the homogenizer main motor.

PRODUCT OPERATION

When homogenizers are operated on more than one product, thus requiring different pressure combinations, manual adjustment of the reducing valve control knob will be required.

Start the feed pump, if one is in use. Adjust the flow of cooling water lines. Check the machine oil level. Separate water piping is supplied to the water-supply assembly used to cool the pistons. Before starting the machine, make certain that the water is running. Direct the flow of the nozzles to the inside top of each cylinder liner.

Make certain that the reducing valve on the HVA panel is in the full open position by turning the knob counter-clockwise. This will permit the full flow of the product through the valve assembly without pressure. Open the product supply valve and start the machine motor.

If the systems are operating properly and the product is pumping smoothly through the machine, start the HVA motor and gradually turn the reducing valve on the HVA panel clockwise, until the desired pressure is indicated on the product discharge pressure gauge. At this point the machine should be functioning properly.

With the exception of listening for abnormal noises and checking gauge for excessive fluctuation, no further attention is needed. If operation is not smooth, immediately turn the HVA reducing valve counter-clockwise to the full open position to reduce pressure and refer to "Constant Requirements" at the beginning of this section.

Before starting and during the operation for the first several days, additional tightening of the top and front nuts is recommended. This procedure will ensure that the individual front and top cap plugs are properly seated behind the one-piece front and top cap plates. (Refer to Cylinder Reassembly Procedure for retorquing of front and top cap plate nuts.)

SHUT-DOWN

1. If an air-operated backpressure valve is used, shut off the air supply.
2. Reduce the HVA pressure to the minimum point.
3. Turn off the HVA pump motor.
4. Turn off the machine.

CLEANING

It is important to thoroughly flush the Micro-Gap valve assembly with water during the flush cycle. It is very important that the HVA pressure is turned off. In this way no particles will be allowed to remain in or around the valves.

SECTION VI

RECOMMENDED REGULAR MAINTENANCE SCHEDULE

DAILY INSPECTION

1. Drain any condensate from the power frame oil through the petcock, before starting the machine.
2. Check the oil level (visible through the oil-level sight glass) and add oil, if required.
3. Check the oil pressure (20-40 psi, 1.4 to 2.8 kg/cm²) and adjust, if necessary.
4. Check the water lubrication and cooling systems. Check water-spray nozzles to make sure they are flowing freely and are aimed correctly.
5. Check for any leaks from cylinder or power frame.
6. With the machine running listen for any abnormal sound.

MONTHLY INSPECTION

1. Check tightness of all bolts, nuts and fittings.
2. Check for oil leaks
3. Check belt tightness and adjust, if necessary.
4. Disassemble and inspect all homogenizing valve and cylinder parts for wear and damage.
5. Inspect baffle packing and crosshead extensions for leaks. Readjust or replace, if necessary.
6. Inspect gaskets and packing for leakage and replace, if necessary.

SIX-MONTH INSPECTION

1. Drain oil, clean crankcase, gear case and oil-level sight glass. Replace oil filter cartridge. Fill with oil to proper level.
2. Repeat all monthly checks.
3. Lubricate motor bearings according to manufacturer's instructions.
4. Inspect connecting rod bearing inserts for possible wear or damage. Replace, if necessary.
5. Inspect and adjust crosshead ball joints.
6. Tighten cylinder stud nuts.
7. Carefully check operation of low oil-pressure switch.
8. Replace HVA oil filter located in HVA oil reservoir.

SECTION VII

MAINTENANCE PROCEDURES

INTRODUCTION

The purpose of this section is to provide maintenance procedures, to recommend lubricants and to list recommended torque values on fasteners.

CYLINDER STUD INSTALLATION

APV Gaulin homogenizers are provided with straight studs, which are factory-installed using anaerobic adhesives. Should loosening occur, studs should be properly reinstalled.

1. Background

- a. Studs used in Series 80 homogenizers utilize straight studs, which are locked into the cylinder block with Loctite 272 anaerobic adhesive.
- b. Anaerobic adhesives, which remain liquid while exposed to air, cure without heat or catalysts when confined between closely fitted steel parts. Steel accelerates the curing process. However, stainless steels require priming prior to using Loctite 272. Use Primer T (747), which contains fine steel particles which develop full strength bonds.
- c. These adhesives will harden in the bottle, if contaminated with metal particles. Do not dip metal parts or brushes into the bottle or return contaminated compound to the bottle after using. Do not mix primers with the compound, as this will also cause hardening.
- d. The shelf life of Loctite compound is guaranteed for one year, minimum, at 68°F ± 20°F.
- e. Loctite compounds are non-toxic.

2. Application Technique

- a. Cleaning—Parts that are to be joined should be solvent-cleaned using Loctite Safety Solvent No. 75559 or any commercially available solvent such as trichloroethylene, trichloroethane, perchloroethylene, MEK, acetone, alcohols or freon solvents. Do not use kerosene, gasoline, naptha, fuel oil, Varsol or Stoddard solvents. These products leave a surface film and can reduce strength greatly, if not flushed off properly. Therefore, apply solvent and flush away oil, dirt and grease. Wipe studs with a clean rag. Blow out metallic or other residue from stud holes with compressed air, then wipe with a clean rag.
- b. Coating—Coat stud threads, which will be covered with Loctite, with Primer T (747) and allow to dry 3 to 5 minutes. Apply a rim of Loctite 272 (color-coded red) around the top edge of the female thread. Thoroughly coat the first three or four threads of the studs.
- c. Installation—Continuous-threaded studs used on top, front and rear plates should be run into the hole to about one extra turn, then backed out to the dimension (2-5/16") indicated on the assembly drawing, D17194 or D17132. All other straight studs should be turned in until they bottom.
- d. Cure—Loctite 272 will cure in one to two hours.
- e. Clean-up—Uncured material may be air-blown or wiped with a clean cloth. Solvent indicated in 2.a. above may be used for clean-up.

PISTON PACKING

Leakage through the piston packing is the result of worn piston packing, a worn packing adjusting ring or scored cylinder liner on the inside diameter.

PACKING REMOVAL

Although it is strongly recommended that the cylinder valves be removed and inspected whenever piston packing is changed, it is not necessary to always remove the valves.

1. Refer to cylinder assembly drawing, D17132 for Model 803 or D171794 for Models 804/805; Tool drawing, C17373 and Figure 6; Figure 14.

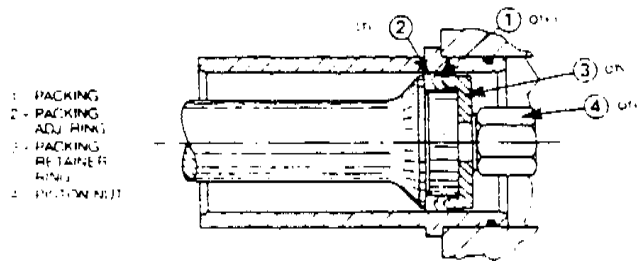


FIGURE 14

2. Remove the front plate nuts (18) and front plate (17).
3. Loosen inlet cap nuts (46) and inlet cap (34) to vent cylinder.
4. Use the cap plug and piston removal tool (T8) to remove the front cap plugs (19).
 - a. Assemble the slide handle and nut to the stem of the cap plug removal tool.
 - b. Thread the screw end of the stem into the $\frac{1}{2}$ " hole in one of the cap plugs.
 - c. Rap the tool outward with the slide handle and remove the plug. Repeat with remaining plugs.
5. Following removal of the front plugs, remove the machine's well cover and rotate the water-supply assembly to the vertical position.
6. Apply the adjustable wrench (T4) to the "hex" surface at the rear of one of the pistons (12) and turn the piston until the wrench handle lays against the left sidewall of the well (facing the machine). This will prevent the piston assembly from turning while the next step is completed.
7. Remove the piston nut (16) at the front of the piston by using the drive handle (T10), drive extension (T11) and piston nut socket (T13).
8. Using the wrench already applied to the rear of the piston, apply the open-end wrench (T3) to the flats on the crosshead extension and completely unscrew the threaded connection.
9. Install the piston removal tool adapter (T5) onto the threaded front end of the piston and tighten only finger-tight.
10. Install the cylinder plug and piston removal tool (T8) onto the adapter and carefully remove the piston assembly, making sure that it does not nick or groove the cylinder liner.
11. Unscrew the adapter and piston removal tools and remove the packing retainer ring (14), packing ring (13) and the packing adjusting ring (44) (see Figure 14).
12. Repeat this procedure with the remaining pistons. Long packing life depends to a large degree on highly polished cylinder liner surfaces. Routine inspection should include examination for possible surface scoring. Heavily scored cylinder liners should be replace.

REINSTALLATION OF PACKING

1. Inspect each packing adjusting ring (44). Replace any rings showing noticeable wear on the outside diameter surface at or near the edge of the concave end.
2. Lubricate a piston packing adjusting ring with a food-grade lubricant and install it onto a piston, making sure that the flat surface of the ring faces the shoulder on the piston.

3. Lubricate and install *one* packing ring (13), making sure that the convex side of the ring nests into the concave side of the piston packing adjusting ring.
4. Install the packing retainer ring (14), making sure that the convex side of the ring nests into the concave side of the packing ring. Check to make sure that the retainer ring fits over the boss on the face of the piston at the bottom of the thread.
5. Lubricate, install and lightly finger-tighten the piston nut (16). Light tightening will ensure that the packing ring is not expanded and will enable the piston to be easily fitted into the cylinder liner.
6. Carefully slide the piston assembly into the cylinder liner (27) until the piston's threaded end comes into gentle contact with the crosshead extension (15).
7. Lubricate the piston thread with a food-grade lubricant.
8. Rotate the crosshead extension and/or the piston to just engage the threads. Too much turning may unscrew the piston nut (16).
9. Then, using only the open-end wrench on the crosshead extension, rotate the crosshead extension until the handle of the wrench lays up against the right sidewall of the well (facing the machine). This will prevent the crosshead extension from turning during the following step.
10. Using the appropriate piston-nut socket, extension and drive handle, tighten the piston nut to approximately 150-ft. lbs. This procedure will serve to tighten both the piston nut and the piston/crosshead extension connection to the proper torque value.
11. Repeat the process with the piston assemblies.
12. Rotate the water-supply assembly to the normal horizontal position.

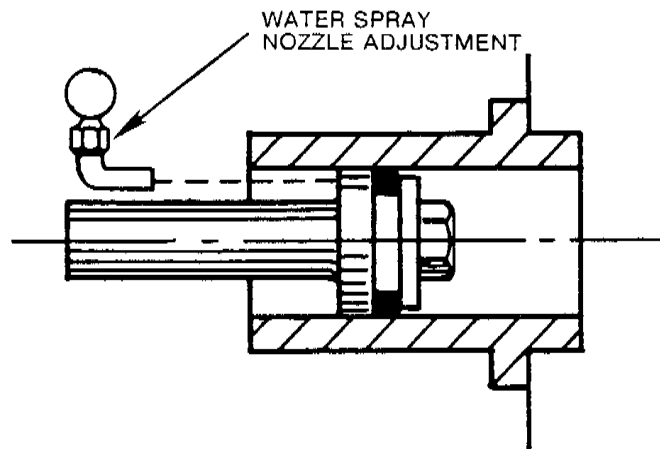


FIGURE 15

WATER SPRAY ASSEMBLY ADJUSTMENT

WARNING: If the spray nozzles become clogged or misaligned, rapid deterioration of the piston packing and cylinder liner will result.

1. Turn on and adjust the flow of water to the water spray assembly to obtain three steady streams.
2. Make sure that the spray nozzles are flowing evenly. A clogged nozzle can usually be freed by working a thin piece of wire into the end of the nozzle.

3. The stream of water from each nozzle should be aimed so that the stream enters the mouth of the cylinder liner, near the inner top surface of the liner (See Figure 15.)
4. The nozzles are individually adjustable. Loosen the tubing nut around the nozzles. Aim the flow and tighten the nut.

SUCTION AND DISCHARGE VALVES AND SEATS

Effective pump valve operation requires smooth seating action between valves and seats. Pits, dents and erosion may cause leakage and loss of pump efficiency.

Minor damage or wear may be corrected by lapping. When lapping valves to their seats, use automotive, medium-grit, water-soluble, valve-grinding compound. Major damage may be corrected by refacing valves and seats on the 45° surfaces. The Rexalloy seats must be removed for rework. APV Gaulin recommends that they be returned to the Factory for refacing. However, the 45° surface may be refaced on a lathe using a carbide tool bit.

PUMP VALVE SEAT REMOVAL AND REPLACEMENT

(See Figure 6 and cylinder drawings D17194 or D17132.)

1. Use the valve seat removal tool (T16) to remove the pump valve seats (8) and (10). The purpose of the rubber cushion on the tool is to prevent damage to the seats or cylinder when the seat breaks loose.
2. Remove the bottom nut (with the two flats) and the rubber cushion from the tool.
3. Place the rubber cushion on the top of the seat to be pulled.
4. Place the metal spacer on top of the cylinder between the studs.
5. With the top hex on the rod, insert the rod through the metal spacer, the rubber cushion and the seat to be pulled.
6. Thread the rod into the bottom nut, which must be held under the seat. The pick-up tool (T17) may be used for this purpose when pulling the suction seats (8).
7. With the rod fully engaged in the bottom nut, run the top nut down until it contacts the top of the metal spacer.
8. With the adjustable wrench (T4) tighten the top nut until the seat is pulled out of the taper in the cylinder.
9. If the seats do not come out easily, dry ice may be used to assist the removal. Pack crushed dry ice around the valve seat and re-tighten the top hex nut.
10. When replacing seats, make certain that the tapers on the seats and cylinder bores are clean and dry. Pack seats in dry ice or immerse in an alcohol/dry ice mixture for twenty to thirty minutes. Install into the cylinder by tapping into place with a piece of wood or brass. Since any leakage between the seats and the cylinder bores will cause cylinder damage, extreme care should be used in assembling the seats.

CAPACITY CHECK

Capacity measurements can be made with water. They should be made with the machine disconnected from the normal processing system. Any bypass lines should be removed. The suction line should be connected to a tank from which an adequate supply of water can be made available. All water should be discharged through the valve system and piped in such a way that a vessel of known capacity will collect all of it.

1. Start the machine and run until all air is expelled from the infeed pipe and cylinder.
2. With all pressure off direct the discharge into the measuring vessel and time the fill with a stop watch. The vessel should have a capacity of about one minute of pumping; i.e., for 6,000 gph use a 100-gallon container.

$$\text{CAPACITY IN U.S. GPH} = \frac{\text{VOLUME (GAL.)}}{\text{TIME (SEC.)}} \times 3600$$

For example: 100 gallons in 60 seconds

$$\text{CAPACITY} = \frac{100}{60} \times 3600 = 6000 \text{ GPH}$$

3. Repeat at maximum pressure. If more than 3% difference occurs, the problem may lie in the condition of the pump valves and seats or in belt slippage. In addition, product compressibility may be a factor, or there may be air in the product.

PRODUCT PRESSURE GAUGE

Gauge problems are due, primarily, to improper care in handling the gauge or severe shock-loading caused by operating either with air in the product or with inadequate infeed pressure.

1. A pressure/amperage curve (see Section V, Figure 13) is useful for rechecking gauge accuracy. Many users permanently install an ammeter in the motor line as a double check on the gauge.
2. Repeated gauge failures indicate possible abnormal operating conditions which should be checked out. If no abnormal conditions can be found, improved gauge life (up to five times) has been obtained by installing a remotely mounted APV Gaulin EPM™. (See Section VIII.)

MICRO-GAP VALVE WEAR/RECONDITIONING

1. Because of the critical tolerances between the Micro-Gap valves, it is important to prevent foreign material from entering and lodging in the Micro-Gap valve assembly.
2. The valve assembly should be inspected periodically to check for the presence of milkstone, foreign material or for wear and/or damage.
3. Record the HVA pressure required to obtain desired homogenizer pressure with a new set of Micro-Gap valves. As the valves wear, additional HVA pressure will be required to obtain this same homogenizer pressure. Do not exceed 200 psi additional HVA pressure. This indicates maximum wear on Micro-Gap valves. Use of more than 200 psi additional pressure may crack the top valve.
4. If unable to obtain the desired homogenizing pressure or if the emulsion quality (as determined by an APV Gaulin EQA™) is not adequate, replace all of the valves, including the base valve.
5. The valves can be resurfaced several times; but, due to the critical tolerances, they must be returned to APV Gaulin for this repair.

MICRO-GAP VALVE ASSEMBLY LEAKAGE

If oil begins to leak out between the actuator body clamp (29) (see drawing D17408) and the discharge flange assembly (11), the actuator O-ring (21) is leaking and should be replaced, along with the back-up ring (20). If leakage of the product being processed occurs from the same area, the HVA rod O-ring (19) is leaking and should be replaced.

POWER-END LUBRICATION

The power frame, housing the eccentric shaft, the driveshaft and crossheads, is gasketed and tightly covered. Although the crankcase (power-end) is vented to allow the escape of heat and moisture, a certain amount of condensation is unavoidable. To avoid oxidation of machined surfaces and emulsification of lube oil, the following procedure is recommended. After the machine has been shut down overnight to permit the water to separate from the oil, open the petcock (located at the right side of the machine) and drain the flow into a container until the flow of water stops and the flow of oil begins. Close the petcock and discard the contents of the container. Check the oil level and add fresh oil, if required.

NOTE: Excessive water in the oil sump may be caused by a leaking cooler, worn baffle seats, defective top cover gasket or excessive humidity.

1. Check the oil cooler by disconnecting one oil line fitting and turning on the cooling water. If the cooler leaks, water will come out the oil connection.
2. To check the baffle seal packing remove the top covers, stand at the side of the machine and direct a stream of water from a hose at the baffle seal area toward the back of the machine. Observe if water comes through into the oil compartment. Adjust or replace, as necessary.
3. Visually check the top gasket and replace, if necessary.
4. Excessive condensation can develop, if the cooling water is very cold. It will be seen as puddles of water standing on flat surfaces when the top cover is removed and as drops hanging from the underside of the top cover. Raising the water temperature and/or insulating under the top cover are methods of correction.

OIL CHANGING

1. Frequency of oil changing depends on the type of service required.
 - a. On intermittent service, change the oil every 500 operating hours or six months, whichever comes first. Always change the oil if it becomes emulsified with water.
 - b. On continuous service, if the oil is free of contamination or emulsification with condensate, it can be used for 2,000 hours.
2. Whenever the oil is changed, clean the crankcase compartment with steam or kerosene and wipe clean.
3. Check strainer at bottom of crankcase for cleanliness and replace the oil filter cartridge, located at the rear of the machine.

OIL PUMP AND RELIEF VALVE ADJUSTMENT

The lubrication oil pump with motor is mounted at the top left of the panel at the rear of the machine (see Figure 16). The oil relief valve is mounted on the head of the pump. The relief valve assembly consists of a valve held against a seat by a spring and an adjustment screw. The adjustment screw is sealed by a copper washer and hex-sided cap.

1. Oil pressure is raised by removing the cap and turning in (clockwise) the screw to increase spring force against the poppet valve.
2. If pressure cannot be increased, remove the adjusting screw, the spring and the valve. Check the seating surfaces of the valve and seat for damage. Repair or replace, if necessary.
3. If the problem still persists, check all oil line fittings for tightness and/or cracks. Check all lubricated points for excess oil loss due to wear and check packing gland on oil pump shaft for tightness. Replace oil pump only as a last resort.

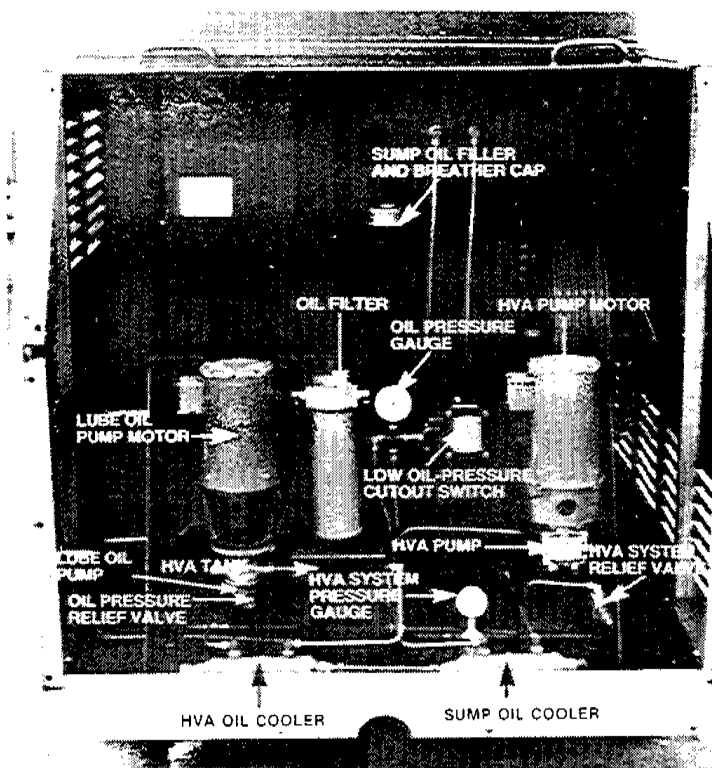


FIGURE 16

LOW OIL-PRESSURE SAFETY CUT-OUT SWITCH ADJUSTMENT

This switch is connected to the lubrication system and is electrically connected to the main motor starter (see drawing C17660). Its function is to shut the machine down, if the oil pressure drops below the set point. Note that, when starting the machine, it is necessary to hold the pull/start switch until the pressure rises above the set point.

To check the set point (with the machine running) loosen the oil line connection at the switch to decrease the oil pressure. If the switch is wired correctly and set properly, the machine will shut down at approximately 10 psig.

To adjust for proper operation:

1. Adjustment is made by first loosening the external Allen set screw. Then, rotate the slotted adjusting screw to increase or decrease setting, as required. Note: After final adjustment is reached, tighten the Allen set screw. Some switches may have an internal knurled nut in lieu of adjusting screw, and adjustment is made by turning the knurled nut up or down.
2. The set point at which the low oil-pressure switch will stop the machine should be checked *at least once every six months*. Using a continuity tester connected to the normally open and common terminals of the switch, jog the machine so that the oil pressure goes above 10 psig. Watch the oil pressure gauge and continuity tester as the pressure stops. The switch contacts should open when the oil pressure drops to 10 psig (+ 2 – 0 psig). If this does not occur, adjust switch per the previous instructions.

COOLING WATER AND OIL TEMPERATURE

Adjust the water flow to the oil cooler, so that the drain water flowing from the cooler is warm but not hot to the touch.

The lube oil temperature can safely run as high as 155°F. (68°C.). If any question arises, measure the actual sump oil temperature. Unless the room temperature is very high, normal oil temperature will be under 140°F. (60°C.)

1. If the oil temperature is abnormally high, the heat could be coming from the motor or from friction in the power-end. If the motor compartment temperature is below oil temperature, the problem can be assumed to be in the components of the power end.
2. High oil temperature can be caused by high oil pressure, too tight or too rough bearing surfaces or incorrect oil.
3. See Section II for oil information and the following pages for parts information.

MOTOR LUBRICATION

Motor bearings should be lubricated only as recommended by the motor manufacturer. Too much lubrication is more damaging than too little. Remove the plugs on the top and bottom of both bearings. With the manufacturer's recommended grease, pump grease into the bottom and allow old grease to flow out of the top. Install the bottom plugs but leave the top ones out until the motor has run long enough to be at maximum operating temperature. Excess grease will have then expanded and run out of the top opening. Reinstall the top plugs.

MOTOR WARRANTY

If provided with the machine, the motor has been selected to meet load requirements and is covered by a warranty issued by the motor manufacturer. Should difficulty arise, contact the local representative of the motor manufacturer, our representative or the Factory. *If any modification or repair not authorized by the motor manufacturer is undertaken, the warranty is automatically waived.*

NEMA motor specifications do not include a temperature rise factor. The motor manufacturer's limitation on temperature rise is dependent on air temperature surrounding the motor during operation. This should not exceed 105°F. (40°C.), unless special motors are supplied.

CONNECTING ROD AND CROSSHEAD ASSEMBLIES

(Figures 17 and 24)

On all models the connecting rod sub-assembly consists of the two halves of the connecting rod (72 and 76), a set of two steel-backed, babbitted bearing halves (74), two bolts with lock nuts (73 and 77), a crosshead bearing retainer nut (81), bearing retainer (82) and ball (83). The crosshead sub-assembly includes only the crosshead (86) and set screws (85 and 87). The crosshead bearing (4) must be ordered as a separate part.

1. The connecting rod bearing halves must be used as a set, but they can be interchanged in the same connecting rod. They are automatically located by the dowels (75).

CAUTION: Make sure dowels are bottomed in holes in connecting rod. Oil film clearance should be approximately .001" per one inch of diameter when bolts are pulled up tight. There are no shim spacers; so, if wear develops to the point where a bearing slap occurs, bearing liners must be replaced.

2. After connecting rod bolt locknuts are removed and replaced a number of times, the locknuts may begin to slip and loosen up. When annual or semi-annual inspection reveals this, replace them promptly with new ones.
3. On Model 803 machines the torque requirement for tightening the crosshead bearing ball into the connecting rod is 60 ft. lbs. (Loosen both set screws before tightening.)
On Models 804 and 805 machines the torque requirement is 90 ft. lbs. (Loosen both set screws before tightening.)

4. The crosshead ball and socket adjustment should be properly maintained, since wear increases rapidly as clearance increases. Adjust as follows:
 - a. Remove the oil line and crosshead cover (64).
 - b. Turn the crosshead by means of the crosshead extension (88) until the crosshead set screw (85) is exposed.
 - c. Loosen the set screw.
 - d. Hold the bearing retainer nut (81) with a crosshead bearing tool (T1), while slowly turning the crosshead extension (88) with its wrench (T3) until a slight drag is noticed on the crosshead extension.
 - e. Lock the set screw at that point.
 - f. Repeat on the others and replace the crosshead cover and oil lines.

CROSSHEAD EXTENSION AND BAFFLE SEAL PACKING

(See Figure 24.)

Because the very critical piston alignment starts at the crosshead, it is important that the shoulders of the crosshead extension remain square and undamaged by mishandling.

1. Tighten the two crosshead extension set screws (87) to pull the crosshead extension (88) back against the square end of the crosshead (86).
2. The shoulder of the piston, tightened against the shoulder on the threaded end of the crosshead extension, maintains and extends the alignment to the piston.
3. Damage to the threads in the stainless-steel extension generally should only be repaired by grinding or cutting away the damaged thread.
4. Baffle packing consists of one Teflon washer (90A), two pieces of square-braided packing (90) and one more Teflon washer, in that order. With the crosshead extension in place install the parts in the baffle gland, being careful that they go completely into place. Using wrench (T2) and light hand pressure, tighten the adjusting nut (89) securely *while the machine is running*. When removing old packing, be careful not to damage the packing box or crosshead extension with the packing removal tool (T6).

GEAR AND PINION

(See Figures 17 through 24.)

1. Normal rotation of the large gear is counter-clockwise when observed from the gear side (right side) of the machine.
2. If it becomes necessary, because of wear or excessive gear noise, rotation can be reversed so that the new, unworn side of the gear teeth will carry the load. To reverse rotation, exchange any two motor leads (in a three-phase circuit), thus, changing motor direction.
3. Gear wear will occur over a long period of usage. It is usually indicated by the development of small pit marks on the working side of the gear teeth. Obviously, this wear will be greatly accelerated by using the wrong oil, failure to drain condensate and water from the oil or by over-loading the machine.
4. Over-loading will occur, if maximum operating pressure is exceeded, if product contains entrained air or if the machine is partially starved through lack of sufficient infeed pressure. A “knock” in the machine usually indicates the presence of air or insufficient infeed pressure. Severe problems can still be caused by these factors when the knocking sound is only faintly audible.

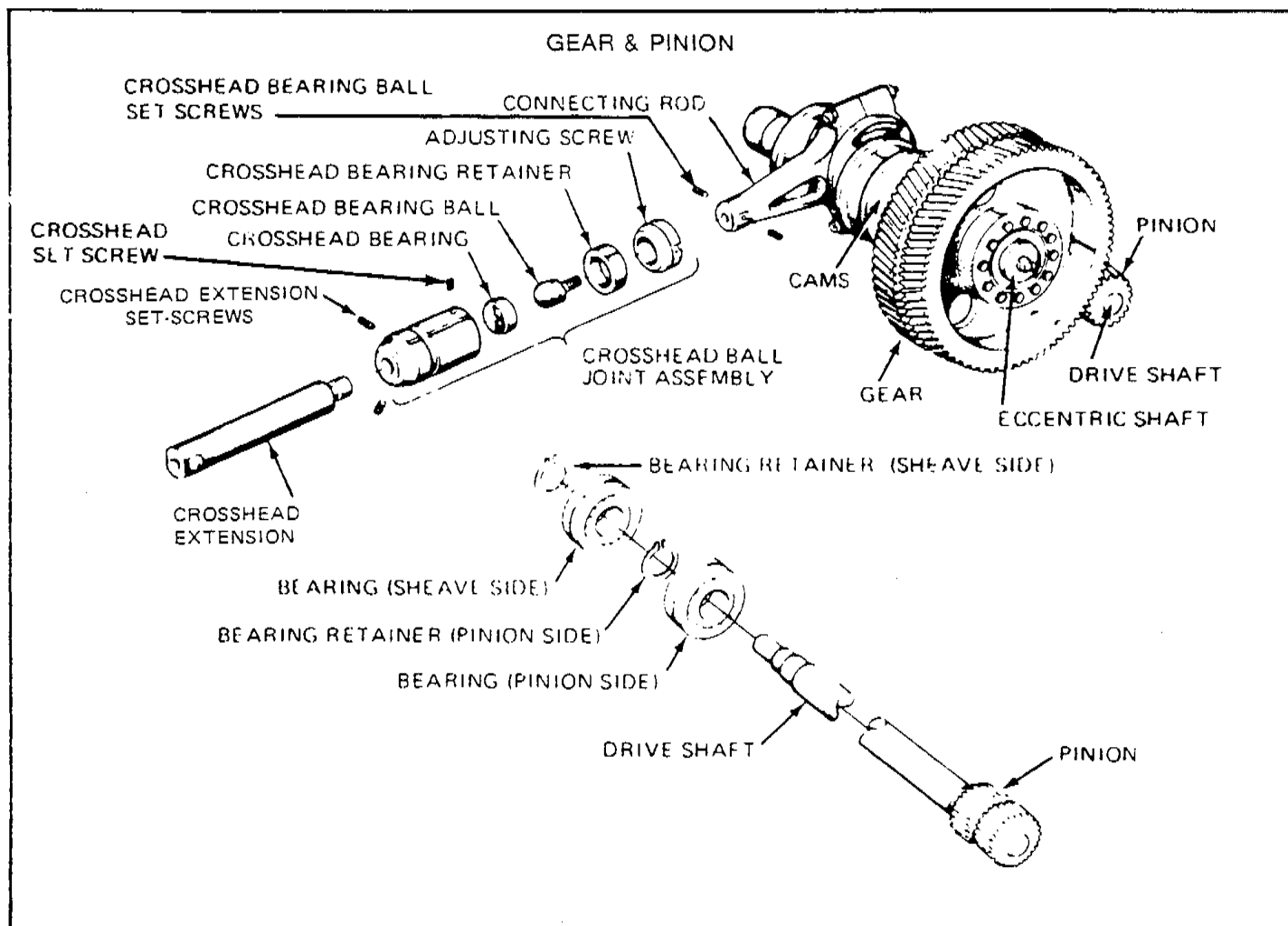


FIGURE 17

5. Gear noises will develop with gear wear. It will appear as a "growl" or "rumbling" sound and will be synchronous with each revolution of the large gear (one full stroke of one piston). It usually becomes louder when pressure is applied to the machine.

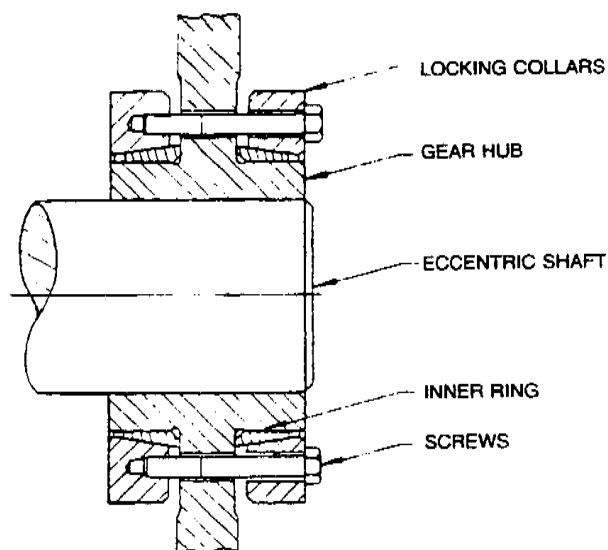
Check clearance between gear and pinion by measuring driveshaft end-play. The minimum should be $\frac{1}{32}$ "

6. The pinion gear is heat-shrunk on the driveshaft and is not removable. Because it is never good practice to replace only one half of a pair of gears which have run together for any length of time, the gear, pinion and driveshaft should be replaced, if any single part requires replacement.

GEAR SHRINK-DISC CONNECTION

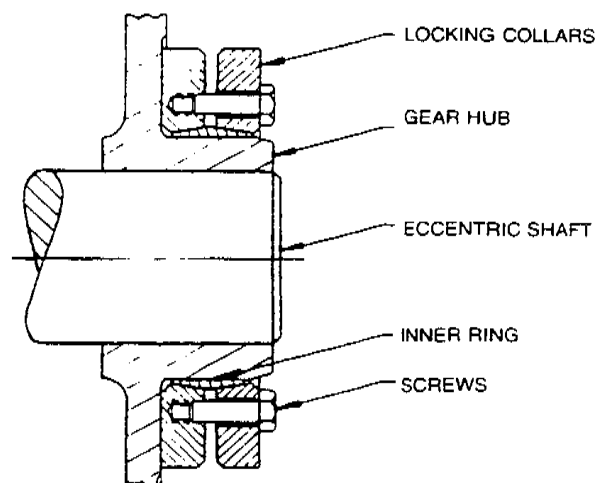
The gear is equipped with a shrink-disc connection which exerts an external clamping force on the gear hub when installed to establish a mechanical shrink-fit between the eccentric shaft and gear.

For the Model 803 the shrink disc consists of two locking collars, two tapered inner rings and locking screws (see Figure 18). For the Models 804/805 the shrink disc consists of two locking collars, as well as a solid, double-tapered inner ring and locking screw (see Figure 19).



SHRINK DISC
MODEL 803

FIGURE 18



SHRINK DISC
MODELS 804 / 805

FIGURE 19

DRIVESHAFT

(See Figures 17 through 24.)

The driveshaft assembly consists of the shaft with a pinion gear heat-shrunk in place, two self-aligning roller bearings (these are not the same size), two bearing lock rings and driveshaft oil seal.

1. The assembly can only be removed and replaced from the gear side.
2. The pinion end-bearing is slightly larger on the O.D. than the bearing for the opposite end. The outer races have only a slight interference fit in the bearing housings, so the shaft can float to be self-aligning. The mesh of the herringbone gear and pinion will move it into alignment.

GEAR AND DRIVESHAFT PINION ASSEMBLY REMOVAL

1. Lock out the electrical power supplied to the machine.
2. Drain all oil from power-end of machine.
3. Remove the top cover, left center panel, right center panel, right rear panel, left rear panel, rear panel, splash cover guard, top bolting hardware and top cover panel supports.
4. Remove the gear case cap screws and the gear case.
5. Remove the drive sheave and driveshaft seal retainer from the driveshaft.
6. Gradually loosen the shrink-disc locking screws all the way around. Initially, each screw should be released about a quarter of a turn only; thus, tilting and jamming of collars will be avoided.
7. Pull the gear from the eccentric shaft. Any rust formed on the eccentric shaft in front of the gear hub must first be removed.
8. The driveshaft assembly will slide out with the gear as the gear is pulled off the eccentric shaft.

DRIVESHAFT ASSEMBLY & INSTALLATION

1. The assembly can only be removed and replaced from the gear side.
2. The pinion-end bearing is slightly larger on the O.D. than the bearing for the opposite end. The outer races have only a slight interference fit in the bearing housings, so the shaft can float to be self-aligning. The mesh of the herringbone gear and pinion will move it into alignment.
3. New bearings are installed on the driveshaft by heating them in oil to 250°F.
4. Slide the pinion end-bearing into place on shaft against the shoulder and install lock ring.
5. Slide the opposite end-bearing into place and install the lock ring.
6. Slide the complete driveshaft assembly into the base from the gear side of the machine until the sheave side bearing enters the sheave side bearing housing. At this point the gear side bearing has not entered the gear side bearing housing.
7. Degrease (solvent-clean) the eccentric shaft gear bore and the outside diameter of the eccentric shaft where it will seat.
8. Slide the gear over the eccentric shaft while lifting the driveshaft to mesh the pinion with the gear.
9. Continue sliding the gear and driveshaft until the driveshaft bearing enters the bearing housing and until the gear seats against the eccentric shaft shoulder. Since the driveshaft bearings are self-aligned, they may cock in the bearing housing. Carefully tap the outer race to align them with the bearing housing and prevent jamming.
10. Tighten all locking screws on the shrink disc gradually and all the way around (not in diametrically opposed sequence). (See Figure 20.)

SHRINK DISC TORQUING DIAGRAM

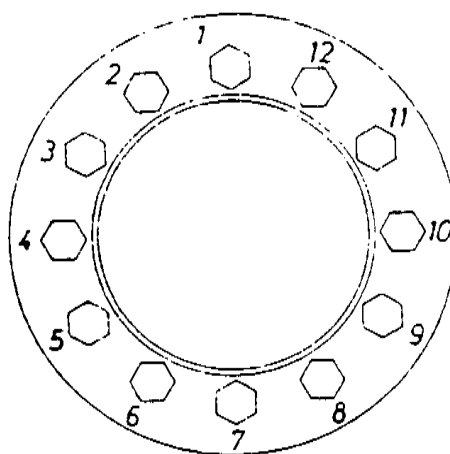


FIGURE 20

Be sure that the locking collars stay parallel when tightening. Several passes are required until all screws are torqued to 42 ft. lbs. Check tightening torque with a torque wrench.

11. Assemble the driveshaft seal retainer and driven sheave.
12. Assemble the gear case and gear case cap screws.
13. Reassemble the top cover panel supports, top cover bolting, splash-guard cover, all panels and top cover.
14. Fill the power-end with proper oil.
15. Resume electrical power to the machine and commence operation.

SHRINK DISC DISASSEMBLY AND REASSEMBLY

(See Figure 18 and 19.)

If replacement of the gear is required, the shrink-disc assembly must be removed from the old gear and installed on the new gear.

1. Removal of the Old Gear

- a. Remove all locking screws.
- b. Remove the locking collars. In the case of the 804/805 gear the inner locking collar should be pushed (toward the gear) off the taper of the inner ring before the next step.
- c. The inner rings are split at one point. If not readily removable by hand, they may be expanded slightly for prying open the split.

2. Installation of New Gear

- a. Refer to Figure 21 for lubrication points. Do not lubricate the gear bore or eccentric shaft outside diameter.
- b. Check, clean and relubricate the following parts, as necessary:
 1. Locking collar inside diameter.
 2. Locking collar threaded holes.
 3. Screw threads.
 4. Inner ring outside and inside diameter surfaces.
 5. Gear hub outside diameter only.

SHRINK DISC LUBRICATION — MODELS 804 / 805

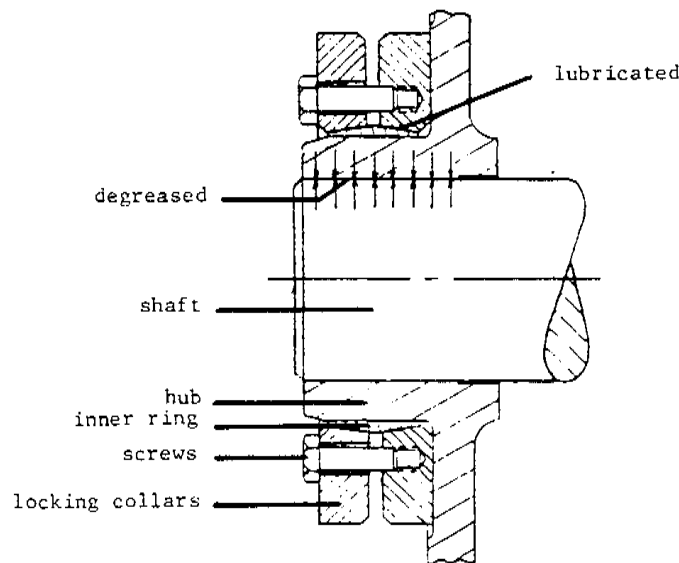


FIGURE 21

For the tapered surfaces one of the following lubricants should be used:

LUBRICANT (MoS ₂)	TYPE
Molykote 321R (lube coat)	Spray
Molykote Spray (powder spray)	Spray
Molykote G Rapid, Aemasol MO 19P	Spray or Paste
DIO-setral 75N (lube coat)	Spray or Paste

Locking screws should be lubricated with a multi-purpose grease, e.g., Molykote or similar.

- c. Assemble, as shown in Figure 18 or 19 as appropriate, with screws only finger-tight.
- d. Reassemble with eccentric shaft as previously described.

ECCENTRIC SHAFT AND BEARINGS

(See Figure 24)

The eccentric shaft is made of a high strength alloy steel center shaft on which are installed ductile iron cams. The cams are located by means of keyways and dowels and are installed using a high temperature shrink-fit procedure. The driving load is taken by the interference fit not the dowels.

Because of this construction, successful removal and replacement of cams is not feasible from a practical or economic standpoint.

1. The shaft runs in two babbitt-lined, full bronze-sleeve bearings. The bearings are located in place by means of dowels in the bottom of the bearing housings. A fiber thrust-washer is mounted on each end of the shaft between the outside cam and the eccentric shaft bearings, making total end-play of the shaft between 1/32" and 1/16".
2. Oil is pumped through the center of the shaft out to each cam so that the connecting rod bearings ride on a cushion of oil under pressure. There are plugs in both ends of the shaft.
3. If bearing replacement is required, note that the fit of the bearings in their housings requires a slight squeeze when bearing caps are pulled down tight. This requires careful checking of oil-film clearance, which should be .001" per inch of diameter, minimum.
4. In the event of damage to the surfaces on the caps or end-journals, do not turn them undersize in a lathe. This would require specially sized bearings which are not available.
 - a. If the surfaces are only slightly grooved, the roughness can be removed using strips of emery cloth. Do not use emery cloth on the babbitt surface of the bearings.
 - b. Even though the cams or end-journals still show light grooving, they can be safely used because the grooves merely trap oil, just as does an oil groove in a sleeve bearing. The important thing to remember is that elevated ridges of metal thrown up when the groove developed must be removed with emery cloth or by careful draw filing.
 - c. If the surfaces are severely damaged or undersized, the best method of repair is to have them metallized and remachined to original size.

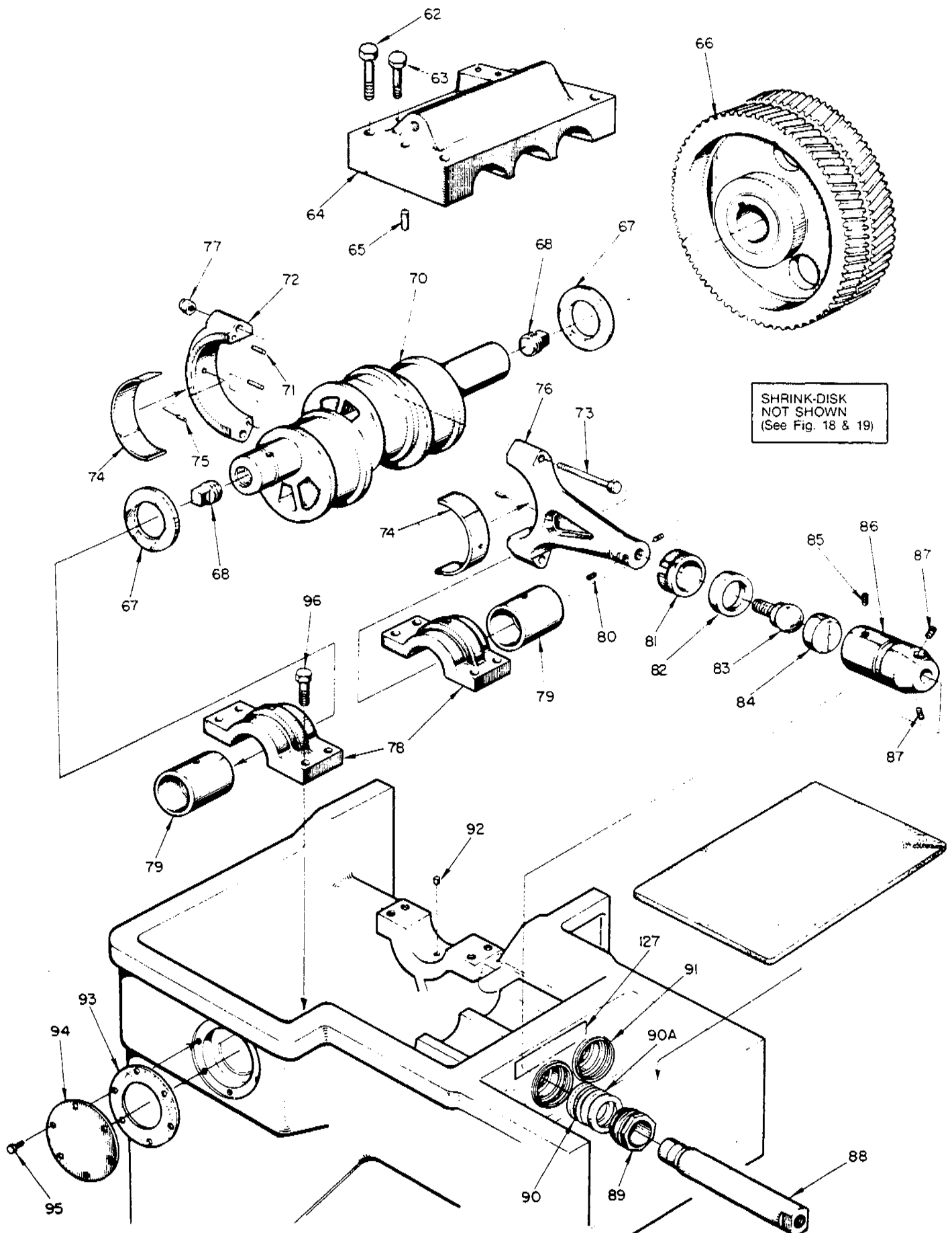
FIGURE 22
PARTS LIST FOR FIGURES 23 and 24

Item No.	Part Name	Quan.	Item No.	Part Name	Quan.
1	Top Plate Screws	Varies	49	Seal Retainer Gasket	1
2	Top Plate Sealing Washer	Varies	55	Gear Case Gasket	1
3	Top Plate Gasket		56	Gear Case	1
6	Gear Case Cap Screw	Varies	57	Cylinder Stud	4
7	Top Plate Assembly	1	61	Pinion	1
8	Bearing Lock Ring (Pinion Side)	1	62	Crosshead Cover Cap Screw	
9	Drive Shaft Bearing (Pinion Side)	1	63	Crosshead Cover Cap Screw	4
11	Drive Shaft	1	64	Crosshead Cover	1
12	Pinion Key	1	65	Crosshead Cover Dowels	2
14	Base	1	66	Gear	1
15	Cylinder Dowel	2	67	Eccentric Shaft Thrust Washer	2
16	Cylinder Gasket	1	68	Eccentric Shaft Plug	2
17	Base Mounting Cap Screw	4	70	Eccentric Shaft Assembly	1
18	Base Mounting Lockwasher	4	71	Connecting Rod Dowel	6
19	Sub-Base	1	72	Connecting Rod Cap	3
20	Motor Rail Shaft Set Screw	2	73	Connecting Rod Bolt	6
21	Motor Rail Collar	2	74	Connecting Rod Bearing	6
22	Motor Rail	2	75	Connecting Rod Bearing Dowel	6
23	Motor Rail Shaft	1	76	Connecting Rod	3
24	Motor Rail Adjusting Screw	4	77	Connecting Rod Nut	6
25	Motor Rail Shaft Support		78	Eccentric Bearing Cap	2
26	Motor Rail Support Lockwasher	4	79	Eccentric Shaft Bearing	2
27	Motor Rail Shaft Support Cap Screw	4	80	Crosshead Bearing Ball Set Screw	6
28	Driven Sheave Assembly (includes 29, 30, 31)		81	Crosshead Bearing Retainer Nut	3
29	Drive Sheave Lockwasher	3	82	Crosshead Bearing Retainer	3
30	Driven Sheave Cap Screw	3	83	Crosshead Bearing Ball	3
31	Driven Sheave Bushing	1	84	Crosshead Bearing	3
32	Driven Sheave Key	1	85	Crosshead Set Screw	3
33	Driving Sheave Assembly (Includes 34,35,36)		86	Crosshead	3
34	Driving Sheave Lockwasher	3	87	Crosshead Extension Set Screws	6
35	Driving Sheave Cap Screw	3	88	Crosshead Extension	3
36	Driving Sheave Bushing	1	89	Packing Adjusting Screw	3
37	V-Belt		90	Baffle Seal Packing	6
38	Motor Rail Shaft Set Screw	2	90A	Baffle Wiper Ring	6
39	Motor Mounting Screw Lockwasher	4	91	Baffle Stuffing Box	3
40	Motor Mounting Screw	4	92	Eccentric Shaft Bearing Dowel	2
41	Driving Sheave Key	1	93	Eccentric Shaft Cover Plate Gasket	1
42	Motor	1	94	Eccentric Shaft Cover Plate	1
43	Drive Shaft Bearing (Drive Side)	1	95	Eccentric Shaft Cover Plate Cap Screw	6
44	Bearing Lock Ring (Drive Side)	1	96	Bearing Cap Screw	8
45	Base Foot	4-6	122	Well Cover	1
46	Drive Shaft Seal	1	127	Name Plate—Serial Number	1
47	Seal Retainer Screw	6	129	Fan Mounting Spacer	1
48	Seal Retainer	1	130	Fan	1
			131	Fan Mounting Bolt Lockwasher	1
			132	Fan Mounting Bolt	1

TYPICAL BASE, DRIVE COMPONENTS



FIGURE 24
TYPICAL BASE, DRIVE COMPONENTS



MOTOR WIRING DIAGRAM

See Dwg. B18502, Section I, "Utility Requirements", and Section II, "Electrical".

CAUTION: It is suggested that a licensed electrician be employed to properly wire in accordance with local codes.

Main disconnect and branch circuit protection as required. Size and type per the National Electrical Code (NEC) and/or local electrical codes.

Wire, conduit and all other electrical materials required for connection of APV Gaulin equipment to be sized and selected based on the NEC and/or local electrical codes for the specific installation.

Disconnect all electrical power to the homogenizer or pump prior disassembly.

This drawing is a suggested electrical wiring diagram and does not apply to special installations. Contact APV Gaulin, if further assistance is required.

SEQUENCE OF OPERATION

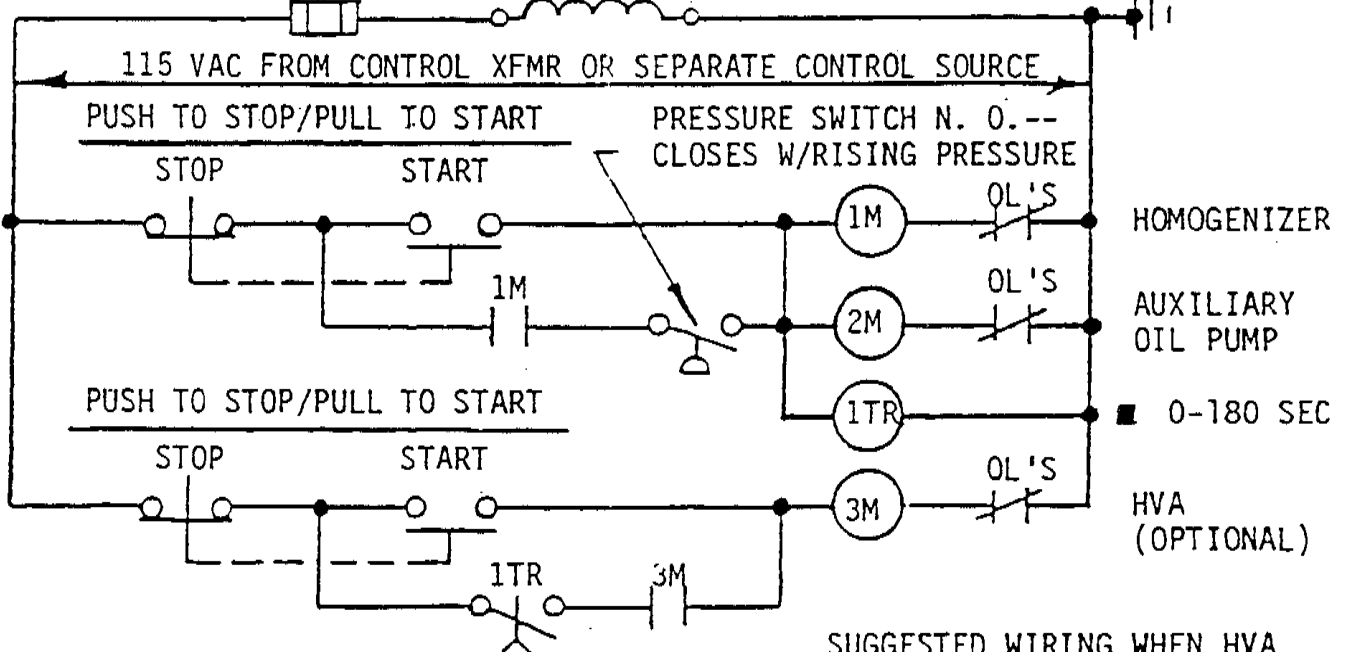
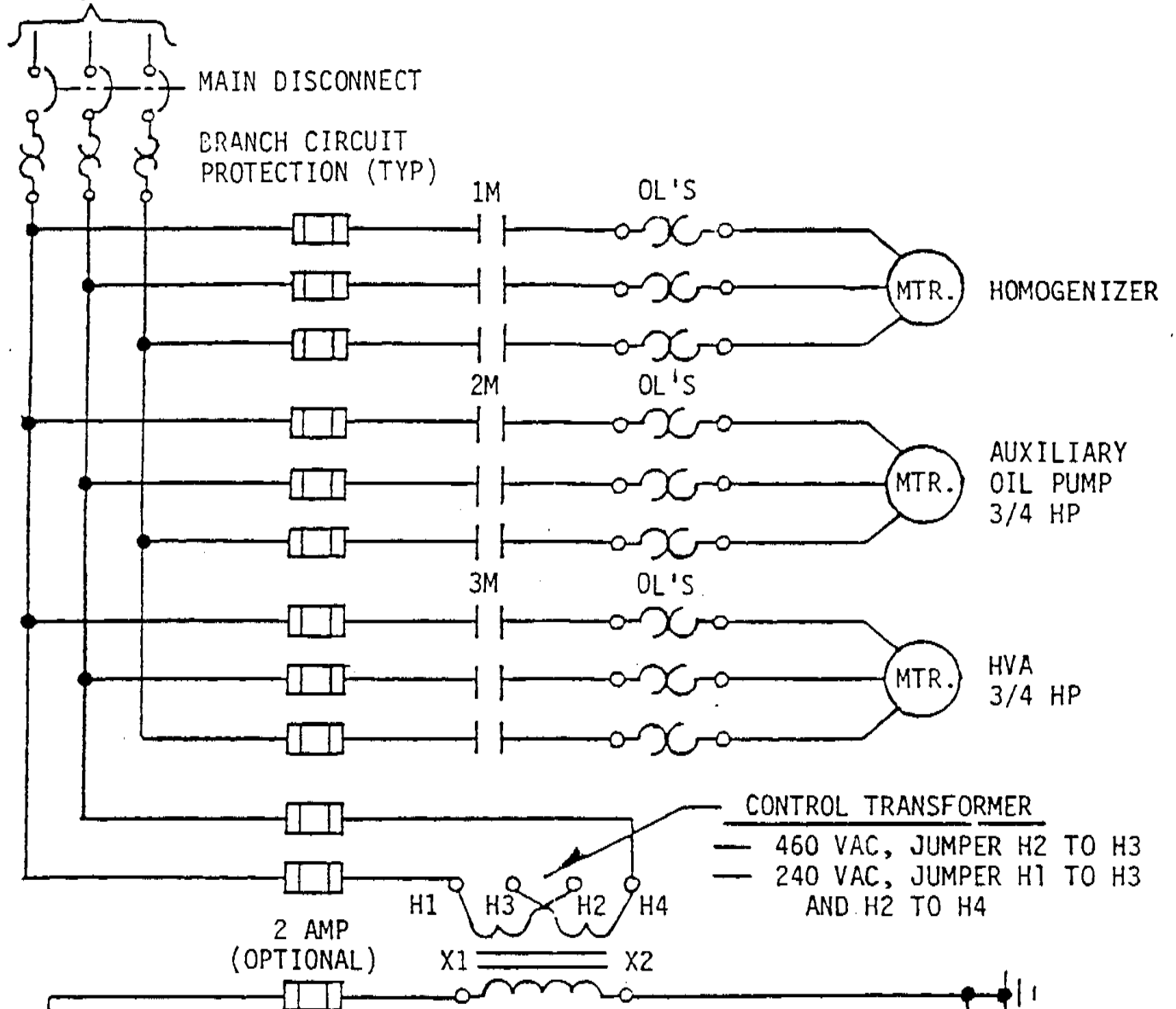
Homogenizer/Pump

1. Pull the "Start" homogenizer button, energizing the homogenizer/pump drive motor starter coil (1M).
2. Simultaneously, the oil pump motor starter coil (2M) energizes, engaging the oil pump motor supplying oil to the homogenizer/pump drive.
3. Delay timer (1TR) energizes, preventing the hydraulic pump from starting until the homogenizer/pump is running (included if unit is fitted with HVA).
4. Contact 1M closes. The pressure switch (wired normally-open) closes when the oil pump produces the correct oil pressure.
5. When 1M and the pressure switch are closed, the holding control circuit is established.
6. The start button is only a momentary contact. It must be held closed until both 1M and the pressure switch are closed.
7. At this point the homogenizer/pump drive motor and the oil pump are running, and oil is being supplied to the homogenizer/pump drive at a pressure that satisfies the pressure switch.
8. If the oil pressure drops below the minimum pressure required, the oil pressure switch will open, and the homogenizer/pump and the oil pump will stop.
9. Push homogenizer/pump "Stop" button to stop homogenizer/pump and oil pump.

Hydraulic Pump (HVA)

1. Pull the "START" HVA button, energizing the HVA motor starter (3M) and starting the HVA pump motor.
2. Contact 3M closes. The timer (1TR) must time out, before holding control circuit is established. Time should be long enough to allow homogenizer/pump to be operating with sufficient flow through pump section. At this point, the holding control circuit is established and HVA pump is running.
3. Push HVA "Stop" button to stop HVA pump.

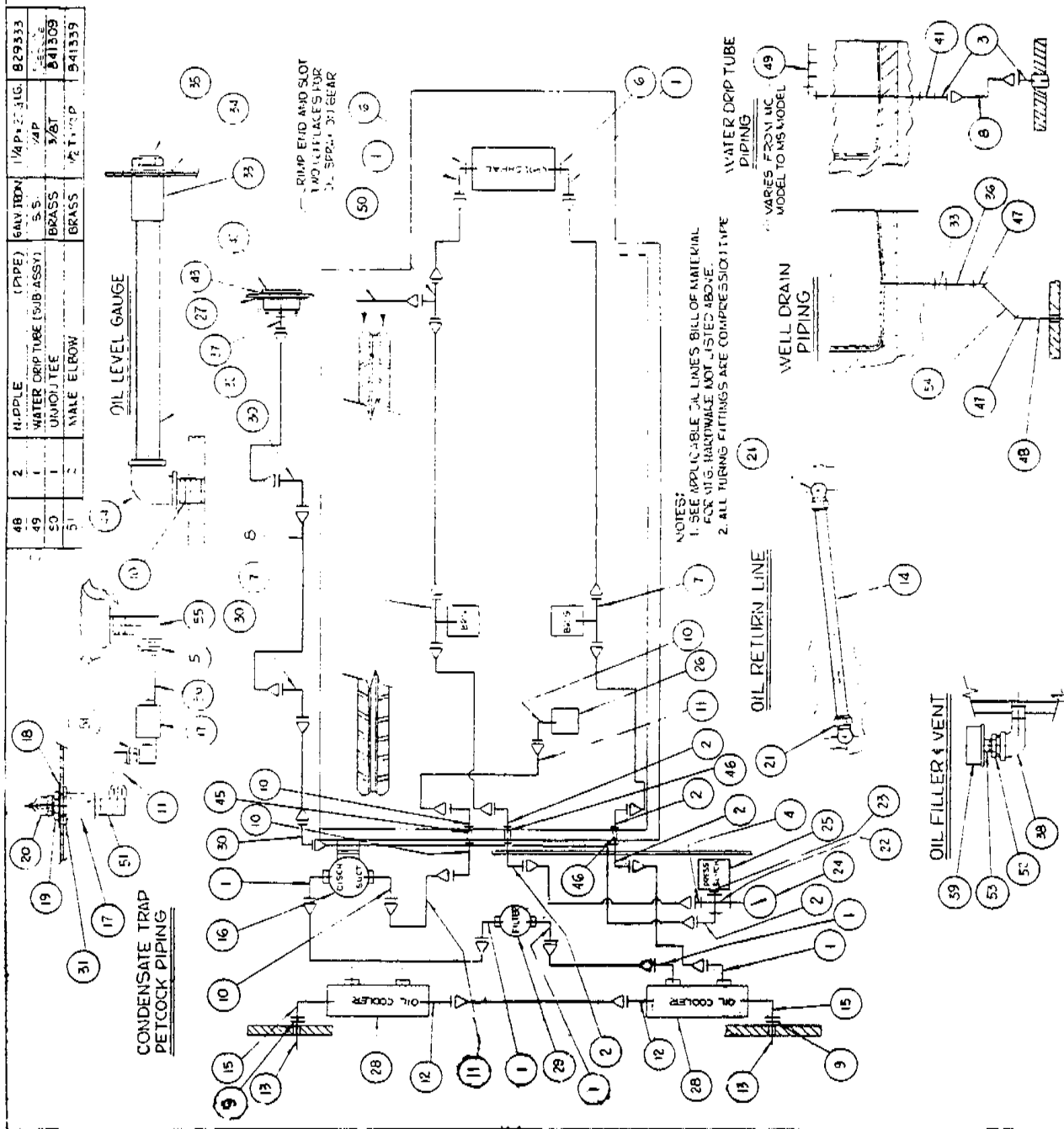
240/460 VAC, 30, 60 HZ. POWER SUPPLY



SUGGESTED WIRING WHEN HVA HOMOGENIZING CONTROL IS INCLUDED.

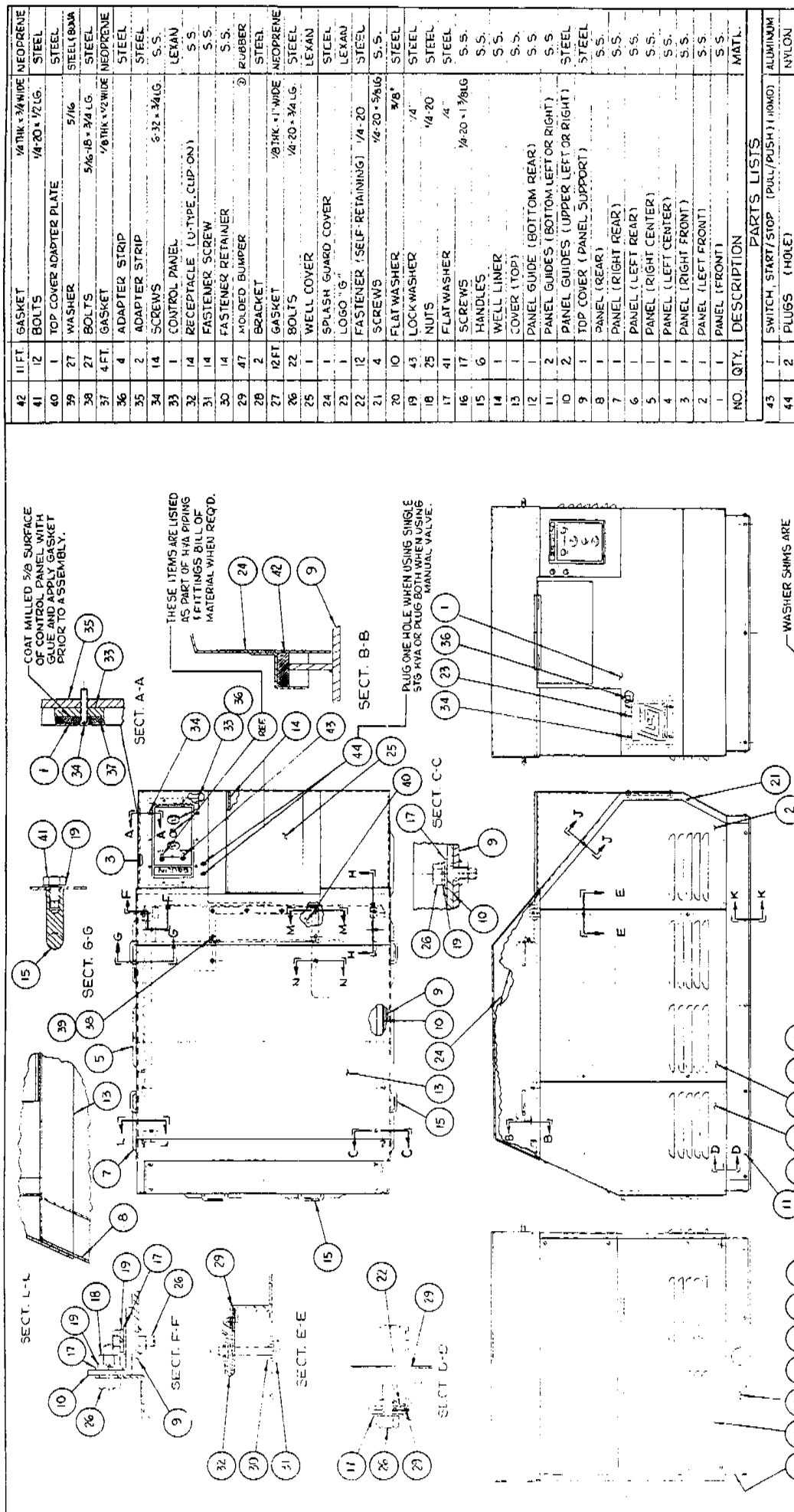
APV GAULIN, INC.			
EVERETT, MASS.			
TITLE WIRING DIAGRAM (MOTORS)			
PATTERN NO.	DATE	BY M. Scamardo	DATE 14 OCT. 87
	SCALE	CH. N. Milo	APP. [Signature]
PART NO.		NO. B-18502	REV. 1

48	2	ALUMINUM	(PIPE)	1/4" P. 2' LG.	829333
49	1	BRASS	WATER DROPTUBE (SUB-ASSY)	1/4" P.	841309
50	1	BRASS	UNIONTEE	3/8" T.	841309
51	2	BRASS	MALE ELBOW	1/2" P.	841339



ITEM#	QTY	DESCRIPTION	MAT'L	SIZE
41	2	ELBOW (45° FEMALE PIPE)	BRASS	1/4" P.
42	2	BULKHEAD ADAPTER	BRASS	3/8" P. 1/4" P.
43	1	ELBOW (FEMALE PIPE - 90°)	BRASS	1/4" P.
44	1	GASKET (OIL PRESS. GAUGE)	BRASS	2" M. 2" I.D.
45	1	PRESSURE GAUGE (OIL)	STEEL	1/8" P.
46	1	PIPE NIPPLE	STEEL	1/4" P. 2" LG.
47	1	REDUCING BUSHING	STEEL	1" P.
48	1	PIPE NIPPLE	STEEL	1/2" P.
49	1	FILLER BREATHER & VENT	STEEL	1/2" P.
50	1	STREET ELBOW	STEEL	1/2" P.
51	1	FEMALE CONNECTOR	BRASS	3/4" P. 1/2" P.
52	1	NIPPLE (PIPE)	BRASS	1/2" P.
53	1	LEVEL GAUGE	BRASS	1/2" P.
54	1	WASHER	STEEL	1/2" P.
55	1	FULL COUPLING	STEEL	1/2" P.
56	1	NIPPLE (PIPE)	STEEL	1/2" P.
57	1	2" T. WASHER	STEEL	1/2" P.
58	1	TUBING ELBOW	STEEL	1/2" P.
59	1	COOLER (HEAT EXCHANGER)	STEEL	1/2" P.
60	1	COOLER (HEAT EXCHANGER)	STEEL	1/2" P.
61	1	COOLER (HEAT EXCHANGER)	STEEL	1/2" P.
62	1	COOLER (HEAT EXCHANGER)	STEEL	1/2" P.
63	1	COOLER (HEAT EXCHANGER)	STEEL	1/2" P.
64	1	COOLER (HEAT EXCHANGER)	STEEL	1/2" P.
65	1	COOLER (HEAT EXCHANGER)	STEEL	1/2" P.
66	1	COOLER (HEAT EXCHANGER)	STEEL	1/2" P.
67	1	COOLER (HEAT EXCHANGER)	STEEL	1/2" P.
68	1	COOLER (HEAT EXCHANGER)	STEEL	1/2" P.
69	1	COOLER (HEAT EXCHANGER)	STEEL	1/2" P.
70	1	COOLER (HEAT EXCHANGER)	STEEL	1/2" P.
71	1	COOLER (HEAT EXCHANGER)	STEEL	1/2" P.
72	1	COOLER (HEAT EXCHANGER)	STEEL	1/2" P.
73	1	COOLER (HEAT EXCHANGER)	STEEL	1/2" P.
74	1	COOLER (HEAT EXCHANGER)	STEEL	1/2" P.
75	1	COOLER (HEAT EXCHANGER)	STEEL	1/2" P.
76	1	COOLER (HEAT EXCHANGER)	STEEL	1/2" P.
77	1	COOLER (HEAT EXCHANGER)	STEEL	1/2" P.
78	1	COOLER (HEAT EXCHANGER)	STEEL	1/2" P.
79	1	COOLER (HEAT EXCHANGER)	STEEL	1/2" P.
80	1	COOLER (HEAT EXCHANGER)	STEEL	1/2" P.
81	1	COOLER (HEAT EXCHANGER)	STEEL	1/2" P.
82	1	COOLER (HEAT EXCHANGER)	STEEL	1/2" P.
83	1	COOLER (HEAT EXCHANGER)	STEEL	1/2" P.
84	1	COOLER (HEAT EXCHANGER)	STEEL	1/2" P.
85	1	COOLER (HEAT EXCHANGER)	STEEL	1/2" P.
86	1	COOLER (HEAT EXCHANGER)	STEEL	1/2" P.
87	1	COOLER (HEAT EXCHANGER)	STEEL	1/2" P.
88	1	COOLER (HEAT EXCHANGER)	STEEL	1/2" P.
89	1	COOLER (HEAT EXCHANGER)	STEEL	1/2" P.
90	1	COOLER (HEAT EXCHANGER)	STEEL	1/2" P.
91	1	COOLER (HEAT EXCHANGER)	STEEL	1/2" P.
92	1	COOLER (HEAT EXCHANGER)	STEEL	1/2" P.
93	1	COOLER (HEAT EXCHANGER)	STEEL	1/2" P.
94	1	COOLER (HEAT EXCHANGER)	STEEL	1/2" P.
95	1	COOLER (HEAT EXCHANGER)	STEEL	1/2" P.
96	1	COOLER (HEAT EXCHANGER)	STEEL	1/2" P.
97	1	COOLER (HEAT EXCHANGER)	STEEL	1/2" P.
98	1	COOLER (HEAT EXCHANGER)	STEEL	1/2" P.
99	1	COOLER (HEAT EXCHANGER)	STEEL	1/2" P.
100	1	COOLER (HEAT EXCHANGER)	STEEL	1/2" P.

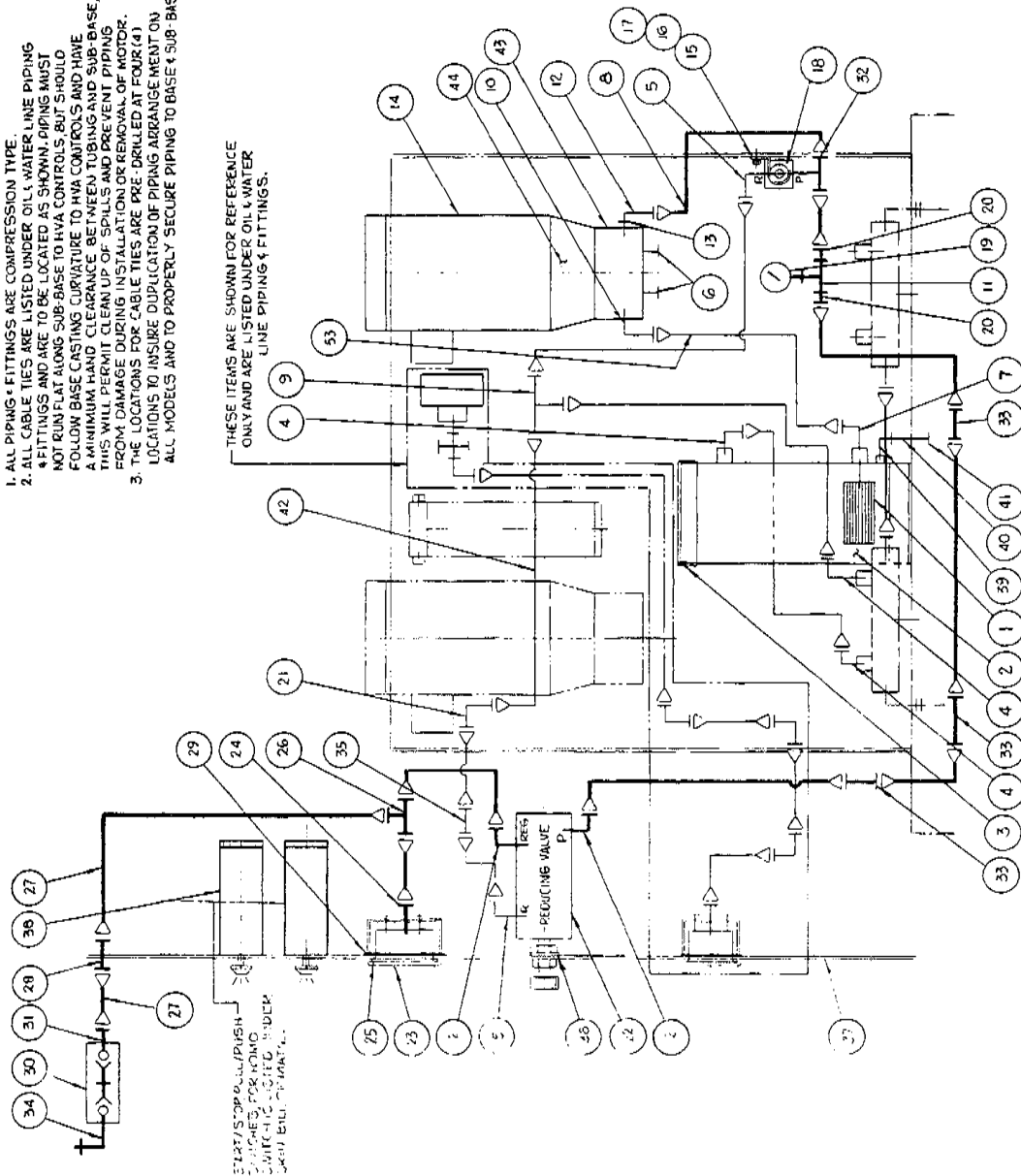
APV GAULIN, INC.
OIL & WATERLINE PIPING & FITTINGS
MODELS 804/805
DRAWING D17459



APV GAULIN, INC.
SKIN ASSEMBLY — MODELS 803/804/805
DRAWING B17440

NOTES:

1. ALL PIPING & FITTINGS ARE COMPRESSION TYPE.
2. ALL CABLE TIES ARE LISTED UNDER OIL & WATER LINE PIPING & FITTINGS AND ARE TO BE LOCATED AS SHOWN. PIPING MUST NOT RUN FLAT ALONG SUB-BASE TO HVA CONTROLS, BUT SHOULD FOLLOW BASE CASTING CURVATURE TO HVA CONTROLS AND HAVE A MINIMUM HAND CLEARANCE BETWEEN TUBING AND SUB-BASE. THIS WILL PERMIT CLEAN UP OF SPILLS AND PREVENT PIPING FROM DAMAGE DURING INSTALLATION OR REMOVAL OF MOTOR.
3. THE LOCATIONS FOR CABLE TIES ARE PRE-DRILLED AT FOUR (4) LOCATIONS TO INSURE DUPLICATION OF PIPING ARRANGEMENT ON ALL MODELS AND TO PROPERLY SECURE PIPING TO BASE & SUB-BASE.



THESE ITEMS ARE SHOWN FOR REFERENCE ONLY AND ARE LISTED UNDER OIL & WATER LINE PIPING & FITTINGS.

ITEM NO.	QTY	DESCRIPTION	MATL	SIZE
53	20 IN.	TUBING	COPPER	1/2" T
52	3	LOCKWASHER (RESERVOIR MTG.)	STEEL	5/16"
51	3	BOLTS (RESERVOIR MTG.)	STEEL	5/16-18-1 1/2
50	4	NUTS (MOTOR MTG.)	STEEL	5/16-18
49	4	LOCKWASHER (MOTOR MTG.)	STEEL	5/16"
48	4	BOLTS (MOTOR MTG.)	STEEL	5/16-18-1 1/2
47	4	BOLTS (MOTOR MTG.)	STEEL	5/16-18-1 1/2
46	1	COUPLING (MOTOR TO PUMP)	STEEL	3/8-16-1 1/2
45	4	BOLTS (MOTOR TO PUMP)	STEEL	3/8-16-1 1/2
44	1	BRACKET (MOTOR TO PUMP)	ALUM.	1/2" D
43	1	TUBING	COPPER	3/8" T
42	40 FT.	PIPE NIPPLE	BRASS	3/8" T
41	1	PIPE NIPPLE	BRASS	3/8" T
40	1	PIPE NIPPLE	BRASS	3/8" T
39	1	STREET ELBOW	BRASS	3/8" T
38	1	START/STOP PULL/PUSH SWITCH	ALUM.	1/2" D
37	1	CONTROL PANEL	LEXAN	1/2" D
36	1	GASKET (SHIELD)	BUNA-N	1/4" x 3/4" D
35	1	UNION (SPECIAL)	BRASS	3/8" T
34	1	SWIVEL ELBOW	S.S.	3/8" T
33	3	UNION	STEEL	1/4" T
32	1	MALE BRANCH TEE	STEEL	1/4" T
31	1	MALE CONNECTOR	S.S.	1/4" T
30	1	2-WAY SHUT OFF COUPLING	S.S.	1/4" T
29	1	GASKET (SHIELD)	BAKELITE	3/8" x 1/2" x 1/4"
28	1	BULKHEAD UNION	S.S.	1/4" T
27	3 FT.	TUBING TEE	STEEL	1/4" T
26	1	O-RING	BUNA-N	2 3/8" x 10 1/4" x 1/4"
25	1	FEMALE CONNECTOR	STEEL	1/4" T
24	1	PRESSURE GAUGE	STEEL	1/8" T
23	1	REDUCING VALVE	ALUM.	1/4" T
22	1	UNION ELBOW	BRASS	3/8" T
21	1	MALE CONNECTOR	STEEL	1/4" T
20	1	PRESSURE GAUGE	STEEL	1/4" T
19	1	RELIEF VALVE	ALUM.	1/4" T
18	1	BOLT	STEEL	1/4" T
17	1	LOCKWASHER	STEEL	1/4" T
16	1	CLAMP	HALB IRON	1/2" T
15	1	MOTOR - VARIES SPECIFIED BY APL	STEEL	1/2" T
14	1	REDUCING BUSHING	STEEL	1/2" T
13	1	MALE ELBOW	STEEL	1/4" T
12	1	PIPE TEE	STEEL	1/4" T
11	1	MALE ELBOW	BRASS	3/8" T
10	1	UNION TEE	BRASS	3/8" T
9	1	MALE ELBOW	STEEL	1/4" T
8	1	PIPE PLUG	BRASS	3/8" T
7	1	MALE ELBOW	IRON	3/8" T
6	1	MALE ELBOW	BRASS	3/8" T
5	1	MALE ELBOW	BRASS	3/8" T
4	1	MALE ELBOW	BRASS	3/8" T
3	1	MALE ELBOW	STEEL	1/4" T
2	1	RESERVOIR COVER	STEEL	1/4" T
1	1	FILTER	STEEL	1/4" T

APV GAULIN, INC.
SINGLE-STAGE HVA — MODELS 803/804/805
DRAWING D17477

SECTION VIII

AUXILIARY PRODUCTS AVAILABLE

APV Gaulin produces several products which can benefit you in the operation of your homogenizer.

The APV Gaulin EQA™ . . . a reliable, easy-to-use instrument that enables you to quickly and accurately determine the emulsion quality of your homogenized milk products. The EQA will quickly tell you when your homogenization is not up to your standards during processing.

The APV Gaulin EPM™ . . . enables you to replace standard, machine-mounted pressure gauges on your homogenizer with superbly durable transducers and a remotely mounted monitor to achieve truly high accuracy and reliability in monitoring operating pressure.

The APV Gaulin Sanitary Pipeline Pulsation Dampener . . . a simple, field-proven device that effectively attacks both the high and low frequency vibrations commonly experienced in pipelines where homogenizers and transfer pumps are utilized. The sanitary dampener is rated for operation with c.i.p. procedures.

Full technical details regarding these fine products are available from your APV Gaulin regional office, your local distributor or from the APV Gaulin Factory.



Your local contact:



APV, An SPX Brand
Phone: (920) 648-8311
Email: answers.us@apv.com

For more information about our worldwide locations, approvals, certifications, and local representatives, please visit www.apv.com.

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